DOCUMENT RESUME

ED 188 594 IR 008 447

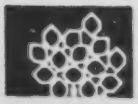
TITLE International Symposium on Technical Information and Its Users (Sofia, Bulgaria, June 15-17, 1977). Reports.
INSTITUTION World Federation of Engineering Organizations, London (England). Committee on Engineering Information.
PUB DATE Jun 77
NOTE 128p.

EDRS PRICE MF01/PC06 Plus Postage.
DESCRIPTORS Data Bases; *Engineering; *Engineers; *Information Services; *Information Sources; Information Systems; Information Utilization; International Programs; Online Systems; Professional Associations; *Professional Training
IDENTIFIERS *Scientific and Technical Information

ABSTRACT

This international collection of papers on the role of technical information in the engineering profession contains 18 discussions on the following: activities of the Committee on Engineering Information (CEI) of the World Federation of Engineering Organizations (WFEO); engineering information in the framework of UNESCO/UNISIST; industrial and technological information in UNIDO; the role of scientific/technical unions of Bulgaria in organizing active scientific and technical information for engineers; tasks of information activity in servicing engineers; information back-up of engineers' activities; user-oriented information services for engineers; information for decision-making by engineers; standards information for engineers; and the training of engineers and engineering students in the use of information services. A summary of the WFEO's symposium and a list of lecturers are included. (FM)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****



World Federation of Engineering Organizations

nittee on Engineering Information

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

ED188594

REPORTS

INTERNATIONAL SYMPOSIUM ON TECHNICAL INFORMATION AND ITS USERS

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

P. Lazar

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

15-17 June 1977
Sofia, Bulgaria

IR008447

CONTENTS

Introduction

ACTIVITIES OF THE COMMITTEE ON ENGINEERING INFORMATION OF THE WORLD FEDERATION OF ENGINEERING ORGANIZATIONS 7
F.K.Willenbrock – WFEO/CEI

ENGINEERING INFORMATION IN THE FRAMEWORK OF UNESCO/UNISIST 11
J. Tocatlian – UNESCO/UNISIST

INDUSTRIAL AND TECHNOLOGICAL INFORMATION IN UNIDO 15
R.T. de Mautort – UNIDO

THE ROLE OF SCIENTIFIC – TECHNICAL UNIONS OF BULGARIA IN ORGANIZING ACTIVE SCIENTIFIC AND TECHNICAL INFORMATION FOR ENGINEERS AND FOR ITS MOST RATIONAL UTILISATION 17
I. Popov – CCSTUB

THE TASKS OF INFORMATION ACTIVITY IN SERVICING ENGINEERS 21
A.I.Mikhailov – USSR

INFORMATION BACK-UP OF ENGINEER'S ACTIVITIES 25
G.Pospelov – USSR

INFORMATIONS ET DONNEES SCIENTIFIQUES ET TECHNIQUES POUR LES INGENIEURS 43
A. David – FRANCE

USER -- ORIENTED INFORMATION SERVICES FOR INGINEERS 53
K. Klintøe – DENMARK

INFORMATION FOR DECISION–MAKING BY ENGINEERS 61
V.Krasnov – USSR

STANDARDS INFORMATION FOR ENGINEERS 67
L.Eicher – USA

INPADOC AND ITS SERVICES 71
O.Auracher – AUSTRIA

PRODUCT INFORMATION AND TRADE LITERATURE FOR ENGINEERS 85
V.Piróg – POLAND

STATISTICAL, ECONOMIC AND MARKETING DATA INFORMATION FOR ENGINEERS 89
S.Al-Shaikhly – IRAQ

TRAINING OF UNIVERSITY STUDENTS OF ENGINEERING IN THE USE OF INFORMATION 99
A.Neelameghan – INDIA

USER TRAINING AS A COMPONENT OF THE PLANNING AND MANAGEMENT OF TECHNOLOGICAL INFORMATION SERVICES 113
I.Wesley-Tanaskovic – YUGOSLAVIA

METHODOLOGY OF TRAINING INFORMATION USERS 117
J.Kuglerova – CSSR

TRAINING FOR ON-LINE USE OF DATA BASES 121
J.E.Creps – USA

THE ROLE OF SCIENTIFIC AND TECHNICAL SOCIETIES IN INFORMATION TRAINING OF ENGINEERS 125
A.Górski – POLAND

Summary of Symposium 129
F.K.Willenbrock

List of Lecturers 133

INTRODUCTION

At the Tunis meeting of the Committee on Engineering Information of the World Federation of Engineering Organizations /WFEO/CEI/ in April 1976 the Committee accepted the kind offer of the Central Council of the Scientific-Technical Unions of Bulgaria /CCSTUB/ to hold its 1977 Symposium in Sofia.

The Symposium, organized jointly by the WFEO/CEI and the CCSTUB, was sponsored by WFEO, Unesco and UNIDO.

On the initiative of Dr. F.K. Willenbrock, Chairman of WFEO/CEI, a Technical Programme Committee was set up by the WFEO/CEI and an Organizing Committee by the CCSTUB in September 1976. The Technical Programme Committee was made responsible for the organization of the intellectual programme and the invitation of the speakers and other contributors, whereas the Organizing Committee assumed the responsibilities for the organization of the meetings, technical arrangements and services, hotel accommodation and invitations to member organizations of the WFEO.

The Technical Programme Committee was chaired by Dr. P. Lázár /Hungary/, Vice-Chairman of the WFEO/CEI, and consisted of the following members: Dr. F.K. Willenbrock /USA/, Chairman of the WFEO/CEI, Ms. A. David /France/, Mr. V. Krasnov /USSR/, Prof. N. Palagatchev /Bulgaria/, Mr. W. Piróg /Poland/, who are members of WFEO/CEI, and also Prof. S. Simeonov /Bulgaria/, Ms. I. Wesley–Tanaskovic /Yugoslavia/, Mr. J. Tocatlian /Unesco/. The Organizing Committee was chaired by Prof. I. Popov, President of the CCSTUB, and consisted of Bulgarian specialists, including Prof. Palagatchev and Prof. Simeonov.

At a joint meeting of the two Committees on 23-24 November 1976 in Sofia the framework of the programme and the preliminary list of speakers was established and the main lines of the organizational arrangements were determined.

The main objective of the Symposium was to discuss and to clarify issues concerning the effective use of engineering information and to provide a forum for the exchange of experience on how to improve the efficiency of information transfer to engineers.

The Symposium centred its discussions around two main topics: a/ information requirements of engineers and b/ education and training of engineering information users. 18 reports were presented. Summaries of the reports received in advance have been reproduced by the host organization and distributed to the participants.

In addition to the discussions which followed the submitted reports, a panel discussion was held on the Unesco Guide for Teachers on the Education and Training of Users of Scientific and Technical Information.

The Symposium was opened by Professor I. Popov, President of the CCSTUB and Chairman of the Organizing Committee, who welcomed the participants on behalf of the host organization and expressed his hope that the Symposium will contribute to the international exchange of experience and international understanding.

Mr. Sadok Ben Jemaa, President of the WFEO conveyed the greetings of the Federation and underlined the growing role and responsibility of engineers in scientific and technical, social and economic development. He pointed to the crucial role information plays in the activities of an engineer.

Dr. P. Lázár, the newly elected Chairman of the WFEO/CEI and Chairman of the Technical Programme Committee, welcomed the participants on behalf of the Committee, informed the audience about the main objectives and tasks of the Committee and its attachment to the big international information programmes of the organizations of the UN family, and paid a tribute to the excellent organization of scientific and technical information in Bulgaria. He also welcomed the Symposium on behalf of the International Federation for Documentation /FID/.

After the official opening session, an exhibition organized by the CCSTUB on the subject of the Symposium was inaugurated by Professor I. Popov

The Symposium was attended by about 250 engineers and information specialists from 15 countries and 5 international organizations.

The WFEO/CEI wishes to express its appreciation to Professor I. Popov, President of the CCSTUB, President of the Organizing Committee, to Professor N. Palagatchev and Professor S. Simeonov, members of the Organizing Committee, to Mr. B. Damyanov, and all members of the Secretariat of the Symposium who contributed largely to the success of the Symposium with the organization of the official programme, visits to the Central Institute of Scientific and Technical Information and other information centres, and a rich social programme including an excursion to the famous Rila monastery.

With the support of the WFEO, the CCSTUB published the reports of the Symposium, after revision by the authors.

Dr. F.K. Willenbrock

Dr. P. Lázár

ACTIVITIES of the COMMITTEE ON ENGINEERING INFORMATION

of the

WORLD FEDERATION OF ENGINEERING ORGANIZATIONS

F. K. Willenbrock, WFEO/CEI

The World Federation of Engineering Organizations is an organization which unites the engineering professional societies of 75 countries. One of its most active programs has been in engineering information; this program has been under the direction of the Committee on Engineering Information.

The Committee consists of engineers and information specialists from approximately 20 countries. The countries vary widely in their degree of technological development. Thus, the Committee serves as a forum for the examination and analysis of questions relating to engineering information.

During the past three years, the Committee has sponsored a series of symposia in conjunction with its annual meetings. The meetings have been co-sponsored by the appropriate professional societies from the host country. We are happy to continue this very effective procedure by co-sponsoring the Symposium on Technological Information and Its Users with the Central Council of the Scientific – Technical Unions of Bulgaria.

The importance of efficient means of obtaining, storing, translating, transmitting, and retrieving technological information is apparent to any country which wishes to make use of current technological developments. The rapid rate at which new technologies are developed and the rapid rate of obsolescence of much current technology has presented the engineering information specialist with problems of greater magnitude than ever before. Much is to be gained by society if increasingly effective means can be developed for making technological information widely available in a more timely fashion in formats appropriate for the user. The Committee on Engineering Information seeks to contribute to this goal.

The subject of this Symposium is properly focused on users. An information system has little value if it cannot provide information which is useful to the engineer who is solving a problem whether he is working on research, design, development, manufacturing, or maintenence. It is evident that information systems need to be well-designed, but it is also evident that users need to be trained to be able to make use of such systems. For efficient operation, the system shoud be designed to meet the needs of the users and, in turn, the user needs to be trained in the use of the system. Very significant advances have been made in a number of professions in the development of information systems well-matched to the needs of the users. In the United States, for example, computer-based onformation systems are presently in wide use by medical doctors and lawyers. These are well-adapted to the requirements of these professionals as they practice their professions. For example, lawyers must have access to the exact wording of the law. The legal information service which has been developed during the past several years by a private company includes full-text of all laws in the data bank.

Considerable progress has been made in scientific and technological information systems; however, there are a number of indicators which show that there is much room for progress in the design of engineering information systems and training of their users. I should like to list some of these indicators.

First, engineers are frequently described by the managers of information services as people who do not use information services much and also as people who read less. These statements may well be true. If so, the explanation could be that the information system is not wellmatched to engineer's needs as well as that he is inadequately educated in the use of contemporary systems. A system which supplies references to documents and leaves the user with the problem of locating the documents and studying them while the user is seeking a single piece of factual information is poorly adapted to his needs.

Second, it is infortunately not unusual in engineering practice to repeat a mistake which has been made previously, even though the knowledge to avoid the mistake is available. As a very simple example, buildings are still built with roofs that leak. If the design is faulty, it could mean that the designer was operating without the information he needed. If the materials are of poor quality, the supplier may not have known how to control the quality of this product. If the construction process is at fault, it could mean that the builder was inadequately informed about appropriate techniques. In any event, many failures could be avoided if relevant information were available on a systematic basis to the engineers responsible for the design and implementation of a project.

Third, another indicator is the large percentage of time that scientists and engineers report they spend in seeking information. One measure of the effectiveness of an information system is the speed with which it can supply the information. The medical profession in the United States has available a system which supplies information about treatment for people exposed to poisons with a very short turn-around time. In this case, of course, rapid response is essential if the information is to be useful.

While other indicators could be listed, it is not necessary to do so since I hope the point has been made that there is much need for improvement in the information systems available even in the most highly industrialized countries. It is one of the objective of the WFEO's Committee on Engineering Information to assist in the development of improved engineering information systems through studies of the needs of engineers and the more precise articulation of these needs.

It is another objective of the Committee on Engineering Information to seek to improve the distribution of engineering information throughout the world. There is at present a very uneven distribution of engineering information. In some countries, engineering practice is severely hampered by the unavailability of needed information on a timely basis. In other countries, much more engineering information is available. By symposia such as the ones held by this Committee in Egypt and Tunis in recent years, means to improve the distribution of engineering information in the developing countries has been sought.

Another very important function of this Committee is to assist the international organizations such as UNESCO and UNIDO in their activities. Many of their programs are very dependent on engineering information. The WFEO as an organization representing the engineering profession throughout the world is in a unique position to contribute to both the planning and programs of these international organizations. On a number of occasions, the Committee on Engineering Information has performed studies and written reports under UNESCO sponsorship. It looks forward to more of such efforts in the future and to increasing its ties with UNIDO.

The technologies are becoming increasingly available to make major improvements in engineering information systems. There are now many machine-readable data banks. The advent of communication satellites has improved telecommunication services throughout the world. Microforms are available to reduce the need for expensive space to store information. Intelligent terminals which link users to extensive computing capability are being used for air travel reservations, financial transactions, and for many other purposes. Engineers have contributed much to the development of such systems and should seek to make increasing use of such technologies to improve their own ability as engineers.

However, technological advances alone are not all that is necessary. There must also be improved institutional arrangements. Both within countries and between countries, the various organizations which supply the services which comprise the engineering information system need to improve their ability to operate efficiently. The publishers, the abstract and indexing services, the designers of computing software, the librarians, and the information specialists who serve as the interface between the information systems and the users are all components of a complex system. Unless appropriate procedures and standards are developed, such organizations cannot exploit effectively the opportunities made available by improved technology. National organizations of engineers and information specialists, international agencies, and also international groups of professional specialists such as the WFEO need to develop policies which will expedite the use of new technologies and facilitate their application on a global basis.

In summary, the Committee on Engineering Information seeks to improve the engineering profession by increasing the availablilty of engineering information and also increasing the ability of engineers to make more effective use of engineering information. This Symposium should contribute significantly to these objectives.

ENGINEERING INFORMATION IN THE FRAMEWORK OF UNESCO/UNISIST

J. Tocatlian, UNESCO/UNISIST

A new international economic order

The acquisition of appropriate and optimal technology to accelerate social and economic development has become a central issue in the establishment of a new international economic order within the United Nations system and its Member States. The developing countries seek to eliminate constraints which hinder their full access and utilization of modern technologies and, at the same time, wish to create their own technologies which are appropriate to their distinct ways of economic and social growth. Technological information plays an important role in this key issue. In fact, at the UN Seventh Special Session in September 1975, it has been recommended that "Developed countries should facilitate access of developing countries on favourable terms and conditions, and on an urgent basis, to 'informatique', to relevant information on advanced and other technologies suited to their specific needs as well as on new uses of existing technology."

Unesco's contribution to the establishment of a new international economic order

The contribution to be made by Unesco to a new international economic order within its spheres of competence involves two levels: a) reflection, ethical action and dissemination of knowledge and ideas, and b) activities in specific areas of science and technology, respect for cultural identity, education, communication and the social sciences.

Unesco's role in this context is "to contribute to the laying of the scientific and technological foundations which will enable every country to make better use of its natural resources; to broaden the scope of education and direct its course so that the people of each country will be better fitted to see to their own development; to develop communications and information systems; and, through the development of the social sciences, to stimulate self-examination in every society in order to help it to derive the greatest advantage from the instruments of change, whilst not losing its own identity."/1/

The role of science and technology

Science is universal and the exchange of information on science and its application among scientists and engineers has greatly contributed to advances on which mankind can draw. Nations are becoming more and more interdependent – a fact which binds them to a common dependence on achievements and progress in technological capabilities.

Science and technology have come under attack, but the decade of doubts seems to be drawing to an end. "The debate over whether technology is or isn't vital for managing our future is giving way to a debate over how to generate our integrated approach to stimulating research, guiding applications and managing the introduction of new technologies."/2/

/1/Unesco, „Unesco's contribution to the establishment of a new international economic and social order:...", para 179, Paris, 8 April 1976, (99 EX/49 Part I)

/2/L.M. Branscomb, Welcoming Address, Fifth International CODATA Conference on Generation, Compilation, Evaluation and Dissemination of Data for Science and Technology; Boulder, Colorado, 28 June – 1 July 1976.

Transfer and exchange of information

In any case information is widely recognized as an essential element in the progress of civilization and society. Lack of scientific and technological information is known to be a serious limiting factor in the economic and social development of peoples. The problem of information is none other than the problem of managing mankind's knowledge. In its medium–term plan for 1977–1982, Unesco has considered the development of information transfer mechanisms by its Member States under three interrelated angles: how to gain access to information, how to manage information, and how to make effective use of information sources. The third aspect is the most important one, since benefit can accrue only through appropriate utilization of information. Placing the user at the centre of our preoccupations brings us to the very subject of the symposium – a most important and timely topic wisely selected by WFEO.

The user of information had been, from the very beginning, at the heart of the UNISIST study which was subsequently launched in 1972 as an intergovernmental programme to promote the establishment of a flexible world network of information systems and services based on voluntary cooperation.

Initial programme activities in UNISIST emphasized information transfer in science and technology. The universality of UNISIST principles and their applicability to all fields of knowledge became gradually recognized in Member States. UNISIST was also acknowledged by the United Nations as the information programme of a general nature designed to provide a conceptual framework for information systems development. It then was accepted by Unesco General Conference at its 19th session in November 1976 that UNISIST had become a conceptual framework for a range of national, regional and international information systems in all fields of learning. The General Conference thus created the General Information Programme of Unesco.

The General Information Programme

The General Information Programme covers basically the activities of the organization in the fields of scientific and technological information and documentation, libraries and archives. An intergovernmental council, composed of 30 Member States, was created by the General Conference for supervising the planning, implementation of the General Information Programme in the interest of the development of education, culture, science and technology in order to promote co–operation between Member States in this programme, to ensure the continuity of UNISIST, and to promote the concept of planning national information systems (NATIS).

The activities of the General Information Programme have been integrated under four sub-objectives: a) promoting the formulation of policies and plans, b) promoting the establishment and application of methods and norms, c) contributing to the development of information infrastructures and to the application of modern techniques of data collection, processing, transfer and reproduction, and d) promoting the training and education of information specialists and information users.

The Director-General was also authorized to set up an Advisory Committee of experts and specialists in the disciplines and professions concerned to assess the changing requirements and trends of the world's user communities in respect of information and advise the Director-General and assist him in evaluating the relevance and adequacy of Unesco's information programme performance in relation to these needs and trends.

The division of the General Information Programme was created in February 1977 regrouping most activities of the former division of Documentation Libraries and Archives

(DBA), and those of the division of Scientific and Technological Documentation and Information (UNISIST). The division of the General Information Programme is attached to the Directorate of Unesco under the authority of the Director of the Bureau of Studies and Programming (BEP).

For the period of 1977–1982, UNISIST activities, as well as other activities within the General Information Programme, encompassing support for documentation, libraries and archives, are being developed in the four subobjectives mentioned earlier, having in view the following targets and desired impact:

a) Promoting the formulation of policy and plans

/i/ A higher level of awareness that information is a resource will encourage the formulation of policies and the incorporation of information in national development plans.

/ii/ Specific provisions for improving national information infrastructures and for developing or participating in specialized information systems will be introduced in an increasing number of regional and national plans.

/iii/ Comparing and harmonizing national policies and plans will increasingly serve information exchange.

b) Promoting the establishment and application of methods and norms

/i/ to achieve a higher degree of compatibility among information systems by creating the necessary tools for interconnexion and thus improve the international flow of information. These tools and techniques are also essential for the effective operation and utilization of national and international information services. To increase the efficiency of information transfer, the quality of standards and other normative material will be improved and their application extended.

/ii/ Sufficient information on standards relevant to the various disciplines and functions and covering all aspects and components of information systems such as terminology, software equipment, procedures, etc., will be made available.

/iii/ To ensure that Member States and particularly developing countries will be able to take advantage of existing methods and standards for systems development and implementation.

c) Contributing to the development of information infrastructures

/i/ It is expected that Member States will have better access to national, regional and international information resources which could be used in support of the planning and implementation of their economic and social development programmes and for the improvement of information transfer. This will be achieved through the creation or development of national information infrastructures including the establishment of systems for the collection, organization and dissemination of information, so as to facilitate retrieval, transfer and exchange as required, and, where necessary, the repackaging of information, in a form comprehensible to the principal users of particular types of information.

/ii/ It is expected that an improvement in the capacity of less developed countries to become active partners in the information transfer chain will be achieved.

/iii/ An increase in the effectiveness and co-operation of the basic components of the overall structure of the information transfer chain – libraries, documentation centres, archives, abstracting, indexing and translating services, special information centres, data analysis centres, referral centres – which determine to a large extent the unimpeded access of the world-wide users' community to the wealth of accumulated knowledge.

/iv/ Progress will be achieved towards the development of specialized international information systems.

d) Promoting the training and education of information specialists and users

Build up in developing countries, or in limited homogeneous regions, the local facilities needed for the professional education and training of the necessary information manpower, at all required levels; promote training for managers, teachers and information specialists needed

to run the national information systems, services and schools; and promote education of user groups for a more effective utilization of information resources.

The user of technical information

The issues related to the "user" of information are fundamental to all aspects and considerations regarding the storage, processing, dissemination and utilization of information. The final goal of an intergovernmental programme, such as the one described above, is to serve the final user of information. The use is the "raison d'être" of the whole machinery of information systems, services, networks and programmes.

In the last biennium, under the UNISIST programme, special attention was paid to the issue of user training. Two seminars were organized on this topic, one in Bangkok for Asia, and one in Rome of an international character. The reports of these meetings are available from Unesco on request. They cover aspects such as user training as a key issue of national information policy, levels of user training, special problems in academic user education programmes, the investigation of user needs and information-seeking behaviour as a basis for user training programmes. A second type of action undertaken by Unesco is the publication of guidelines and instructional material, such as the "Education and training of users of scientific and technical information – UNISIST Guide for teachers". A third type of action has been the promotion and organization of workshops for the training of users in Unesco Member States.

The area of user needs and user training and education will continue to receive attention in Unesco's General Information Programme, under which a number of specific projects and activities will be undertaken, in collaboration with appropriate non-governmental organizations.

INDUSTRIAL AND TECHNOLOGICAL INFORMATION IN UNIDO

R. T. de Mautort, UNIDO

For 10 years of its existence UNIDO has been serving its purpose of furthering the industrialisation of developing countries, in particular through the provision of information needed for the planning, management, and operation of industry over the total spectrum of the various branches of industry and of the various levels of decision making concerned. The Industrial Inquiry Service of UNIDO has been serving queries from every developing country by drawing for answers on sources of information in industrialised and developing countries alike. Numerous national polytechnical, sectoral or specialised industrial information centres have entered into formal „Network of Correspondents Agreements" with UNIDO under which answers to queries are provided very generously and at little or no cost. The information required is not strictly technological but also economical, managerial, commercial, etc.

The Inquiry Service has built up an important store of knowledge, retaining copies of answers provided for renewed use when queries similar to the original are received. Over and beyond this, UNIDO has been engaged in technical assistance to developing countries calling on highly specialised expertise. Each technical assistance operation completed has left detailed feasibility or action reports as well as studies which, all together, make up an impressive collection of industrial information material, most of which along with UNIDO documents and publications are abstracted and published in the series of Industrial Development Abstracts. UNIDO also currently turns out a very successful publication: The Guides to Information Sources, of which upto now 24 branches of industry have been covered. The UNIDO Newsletter carries information on technologies available for transfer, investment opportunities, etc. In sum, over the past 10 years, UNIDO has developed into a general clearing house for industrial information aiming at serving industry in developing countries.

As those 10 years went by, industrialisation of developing countries has turned into a global macro-economic proposition to be served with quantified objectives. UNIDO at a new level of concern, calling for studies and consultations between the agents of economic development in industrialised and developing countries alike, in particular taking each individual sector of industry, in order that the accelerated industrialization of developing countries take, as much of a planned, organized and harmonious shape as possible so that the paramount preoccupation of the United Nations for peace, economic, and social development alike can be met.

A factor of harmony in industrial development is the introduction of technologies appropriate to the needs and particular conditions, physical and socio-economic alike, in the countries concerned, and also access to technologies generated in industrialized countries on comparable and favorable terms. An expansion of industry in developing countries to the extent planned in the Lima Declaration and Plan of Action on Industrial Development and Co-operation, which was the outcome of the Second UNIDO Conference held in March 1975, namely a minimum 25% of the total world production in the year 2000, does call for increased attention to this aspect.

Thus the Lima Plan of Action has foreseen that a programme of action be developed on appropriate technologies and therefore the establishment by UNIDO of an Industrial and Technological Information Bank should be considered. Subsequent UN Assembly Resolutions have confirmed UNIDO in the role and the WFEO will be interested in reading the reports by

the Executive Director addressed to the IDB under.

Of particular interest in the context of information is the establishment of an Industrial and Technological Information Bank, which will represent a specific effort "to make available a greater flow to the developing countries". While industrial information of a general character will continue to be dispensed as hereto/or specific efforts are going to be made in the form of a pilot operation to meet technology selection needs within four selected sectors of industry, which are recognised to be priority areas, for the industrialisation of developing countries. These sectors are: Iron and Steel; Fertilizer Industry; Agro-Industries; and Agricultural Machinery and Implements. The pilot activity that will be undertaken under these headings in 1977–78 include the following:

(a) Mobilizing and organizing in-house information and the systematic expansion of this information in the sectors chosen for the pilot activity;

(b) Collecting selected information from external sources;

(c) Creating a network of information for the identification and selection of technologies through joint action with United Nations agencies and other international or national institutions;

(d) Establishing interlinks between the Bank and the users in the developing countries, including a continuous appraisal of their information requirements;

(e) Preparing technological profiles in the sectors chosen for the pilot operation;

(f) Building up a stock of technological information in the four chosen sectors and processing it for selection purposes;

(g) Identifying and utilizing technological sources and capabilities available in developing countries;

(h) Evaluating the pilot activities at the end of the second year of operation.

The Secretariat will be addressing itself to engineering organizations all over the world to obtain information on technologies in these areas on the one hand, and it will address itself on the other to all those engaged in developing countries in the planning and the decision making process for the selection of appropriate technology.

The computerized connotation of an information bank concept is not overlooked but is not considered to be essential to the pilot operation suggested, which is offered as an information and advisory service to developing countries. As it develops, the Bank will present its own characteristics, offering, as time goes by, increased material for system analysis and eventual computerization of the system.

THE ROLE OF THE SCIENTIFIC–TECHNICAL UNIONS OF BULGARIA IN ORGANIZING ACTIVE SCIENTIFIC AND TECHNICAL INFORMATION FOR ENGINEERS AND FOR ITS MOST RATIONAL UTILIZATION

I. Popov, CCSTUB

The rapid development of scientific and technical progress introduced some essential changes in the character of scientific and technical information (STI):

1. With the fast development of scientific and technical progress not only has the technology of production changed, but also the structure and character of productive labour. Productive labour has become more and more intellectual in character, requiring educated men in production. Gone is the time when men in production were only executors of instructions elaborated by scientific and managing bodies. Greater creative initiative is demanded from production personnel, increased management responsibilities are given to lower levels of management. More and more in the entire process of research, development, production and management the collective brain of the whole personnel is included. This, in turn, tends to accelerate scientific and technical progress, represents a great capital of the nation, which should be utilized to its full value. But this also imposes another great requirement – this collective group has to have current awareness of the development of scientific and technical progress in its sphere, i.e. STI to reach all specialists engaged in the integral proces of a given production, not only those specialists engaged in research and development activity /RDA/.

2. STI is the initial stage of every creative activity. It gives us the possibility to make use of the collective brain of the whole human race, it is the mightiest generator of new ideas, it saves time, means and personnel, prevents mistakes.

That is why STI developed so quickly and so widely. Systems of STI were developed in research and development organizations, enterprises, management organizations, firms, individual branches, state and international centers. The STI systems are automated more and more with the help ofcomputertechniques and micro- photography.

All this allows an easy access to full STI on every question of interest to us.

3. The body of published STI has grown extraordinarily: scientific publications, patents, standards, technical documentation(forecasts, catalogues and so on), dissertations, surveys and other reports, statistical data etc. It is no longer possible for a specialist to folow all STI in his field. And if he attempts to do it, no time will remain for his own creative activity. This imposes the need for a certain selectivity of information, i.e. to choose according to pre-determined criteria only the most important, and from that to hand in only the essential, the necessary, and only after this, according to the evaluation of the user, to study some of the data in detail. This selection can be made by specialized groups in STI.

In general one can say that in the present condition of scientific and technical progress it is necessary for STI to be handled by specialized groups in STI and to be presented in a respective volume, form and content to all specialists in a given field of human activity.

How this is done in our country now is also to a large degree true for many other countries.

In every organization engaged in RDA (scientific research institute, design bureau, project drawing organisation, higher educational establishment and so on), in every big enterprise, there is a bureau for STI (BUSTI), part of the national system for STI, at the head of which is the Central Institute for STI (CISTI).

Regular STI received is handling in the following four ways:

1. CISTI and BUSTI regularly issue information bulletins on international and national news of interest in the individual branches of science, technology and production, which are sent on an exchange basis. These are short summaries, extracted from the received STI.

2. BUSTI elaborates information announcements about the STI received on questions on which the organization is working.

3. BUSTI organizes the supply of original sources (magazines, patent descriptions, reports etc.) at the request of the specialists.

4. In the so called "technical cabinets" exhibited for general reading are the newly received scientific and technical magazines, reference journals and bulletins, prospects, catalogues, patent descriptions, standards, reports etc.

How and by whom are those materials used?

STI received in those four ways is used only by a limited number of specialists, mainly those engaged in RDA . It is used by a very limited number of specialists in production. Entirely occupied with carrying out the production plans and with social and family duties, the larger number of specialists can not find the time and energy to study and utilize the available scientific and technical information.

In this connection the major task of Scientific-Technical Unions /STU/ is to organise with the help of their social forms of work to bring the STI to all engineers, technical and economic parsonnel and by these methods to actively include them in the creative search for its most rational utilization.

The known methods for bringing scientific and technical information to interested consumers have one common trait -- that the information is the passive role. To use it the consumer has to manifest some activity – to get it, study and utilize, i.e. this is the active role.

Life offers us a convincing example of an information system, in which information plays the active role. This is television. It offers its information already processed, which the consumer understands without additional efforts, i.e. he is passive. The powerful influence of television is known, in spite of the fact that it is broadcast mainly in the evening to viewevs already tired from daily labour.

A similar form of influence can be organised also with the scientific and technical information: for every major article or for group of articles and for the technology of their production a group of responsible specialists follow systematically, study and analyse all the information as it concerns them and reports periodically to all interested specialists at meetings convoked by the scientific and technical society, the district or the central organs of the STU. International innovations are reported, such as: patents, standards, publications, data from exhibitions and fairs, forecasts, catalogues, trade offers, reports from commissions, specializations, scientific conferences and so on, with a comparative analysis of the advantages and disadvatages in respect to our home production and with proposals for their use. It is obvious that in this case the participants in the meeting take a passive role, and the information, made with reports, drawings, projections of films and slides, prospects and so on, has the active role. That is why this way of informing a large group of active specialists, is called active scientific and technical information. Both international and national practice have shown its great efficiency: the participants in the meeting join in the discussions in a lively way and as a result, make valuable proposals about concrete measures, with the aim to improve production in competition with foreign achievements. There is a double benefit: on the one hand the collective creative brain is used, and on the other – the entire collective group is aware of international achievements. These meetings are not scientific conferences, since scientific reports are not read at them, but only comparisons between world novelties and home

production are made. In 1977 the STU began with the collaboration of CISTI, the systematic introduction of the active scientific and technical information, so that it would include gradually all basic production and economic activities as an inseparable part of the national system for scientific and technical information.

The active scientific and technical information may deal with all aspects of a given product and its production, or only to certain significant parts. In order that STI may successfully play its great role, it is necessary that the meeting, devoted to this information should take place at least once a year; to be prepared by the most competent specialists; to be well organised – with good conditions for reading and projecting; to have all interested specialists take part in it, such as: scientific workers, designers, technologists, service specialists, traders and others.

THE TASKS OF INFORMATION ACTIVITY IN SERVICING ENGINEERS

A. I. Mihailov

The intensive development of science and technics and the broad application of the latest scientific and technical attainments in production are the determinating factors for the present-day worldwide scientific and technical progress. Since science and technics are closely connected by means of complex and varied links, it is difficult to draw a line between tham at present. Nevertheless, science and technics are two basically differing kinds of activity. The purpose of science is the study of the laws of nature, of society and of mind; the purpose of technics – the creation and development of the implements and means of production, transport, communications, research, education, management, medicine, culture and everyday living. To achieve these purposes the scientists and engineers have some complex problems to solve. One of them is connected with raising the efficiency of their work. The accelerated rates of scientific and technical progress sharply accentuates the problem of providing the scientists, engineers and all workers in the fields of science nd production with the needed scientific and technical information. At the same time the effeciency of science itself is closely connected with the social mechanism of scientific communications, which comprises the processes of presenting, transmitting and receiving of scientific information. The scientists and specialists themselves participate in all these processes.

However, the increasing complexity of scientific work and the necessity to raise its efficiency have led to the differentiation and organizational formation of the scientific-information activities.

The information of scientists and specialists can be efficient only if properly designed to cope with the particular information needs of the various groups of users, supplied by a certain information body. On the basis of their place in the cycle "science-technics-production" and their specific information requests, it is possible to point out three main groups of information users: research scientists, engineers, and managers of various levels.

The nature of work of these groups determines the peculiarities of their information needs. The information needs and habits of engineers, in contrast to scientists, are characterized by the following:

– engineers need far more complex and multi-brach oriented information;
– engineers express their information requests more clearly than sceintists;
– the information needs of engineers are more concrete;
– the information needs of engineers are more dynamic;
– engineers need varied scientific information at the different stages of their design work, the nature of information changing as well, as the terms of receiving;

– scientific information for engineers has to undergo more preliminary examination, analysis and generalization than information used by scientists;
– engineers need more concrete facts and data than scientists;
– the information needs of engineers should be satisfied faster than those of scientists.

The engineers draw information from sources differing somewhat from those, used by scientists, the main source of scientific information for the scientists still being the scientific journals. The engineers are more willing to make use of the centres for scientific and technical information.

The managers of various levels, perticipating in the decision-making process, constitute a special group of users. The manager usually makes decisions under time constraint lack of necessary information. The information needs of managers determine the folowing basic requirements to the scientific and technical information used: a high degree of analysis and

synthesis performed; the least possible volume with no losses of requested data; reliability and authenticity; forecasting approach; accuracy in the on-time presentation and in the form, required at the various levels of management.

The differences in the information needs of scientists, engineers and managers determine the differing tasks of information activities according to the different groups of users.

To solve his engineering problems an engineer needs information concerning his branch and the marginal fields of knowledge. The contemporary information requirements of engineers are usually complex and multy-branch oriented.

The information needs of engineers-economists, engineers-designers, engineers-constructors, engineers-technologists and others can be studied in analysing the process of creation of complex engineering objects, as for example airplanes, ships, etc. The scheme of their creation comprises such united blocks as management strategy, prognostication, design, technological preparation of production and construction. If we take one single block out of the scheme, for example the design, and analyse the process of designing an engineering object, it will be possible to define the basic information needs of engineers and demonstrate the complex, interscience character of the information required. The entire process of designing an engineering object is realized, some variations taken apart, in three basic phases, each of them comprising a number of stages.

The first phase includes planning the development of the engineering objects of the concerned category and defining the technical commissions for the very design /optimising the structure of the engineering objects of concern destination/.

The creation of a mathematical model, simulating the work patterns of the engineering objects – both, demand vast scientific and technical information on general problems: government policy and legislation in the field of creation, development and application of the objects designed; trends in the development of the branch to which the designed objects are offered; marketing; economics and planning of the production with which the objects will be connected; capacities of the building enterprises and plants, etc.

Besides that information is necessary concerning the technical and economic characteristics of other up to date similar model-objects.

The resulting information to be used further in computer processing is the result of hard human intellectual work for preliminary data processing such as selection, analysis, generalization, etc.

In the process of interactive decisions, depending on the task formulation, a computer can find out the adequate project characteristics of the engineering objects, the quantity needed for the further growth of the branch or for replacement of the aged objects. At the same time, the computor gives information about the proper amount of capital investments to answer the requests of the fixed objectives. These output data can serve as a basis for the formulation and composition of long-term state plans. Besides that, the indices of the technical commission will be used as input information for the second phase of designing.

In the second phase, depending on the concrete conditions, a sketch or technical design is worked out /optimizing the engineering object itself/.

Here again, in the first stages a great amount of information materials and their analysis is required. First of all, it is necessary to analyse the scientific and technical information and the project papers on possible architectural and constructional types and forms of the object designed on machinebuilding materials; on main and auxiliary power systems, etc. In the process of working-out a mathematical model of the project to cover all the requirements posed, they analyse the corresponding information in order to set the technical limitations of the design.

In this phase the basic parameters of the object are optimised according to some economic criteria. The phase is concluded by defining the technical, operational and economic indices of the optimum version or necessary number of versions.

In the process of designing, as in the first phase too, there generates new information, which is to be analysed, selected and introduced in the corresponding blocks of the information subsystem for further use.

The third phase comprises the generating of the working design. This phase is used mainly for perfection and working-out in details of the project, obtained in the second phase. That's why this phase requires information, contained in the earlier formed blocks of the information subsystem. The difference is that the third phase requires a more detailed information, concerning for example the technology of the object construction. Moreover, in this phase information must be provided for the stages of working design, such as descriptions of inventions in invention vertificates and patents, standard and other normative materials.

The results of the third phase are the working design and the construction drafts of the object. The information obtained in the third phase of designing, serves as input data for production management, for cost and inventory control and could be usefull in many other cases.

The analysis of the basic stages in designing of engineering objects shows the importance of differentiated evaluation of the information available to research scientists and designers at any stage of designing.

On the results from the differentiated evaluation and assesment of the completeness of the needed information depend all the phases and stages of design and research of engineering objects, formulation of the problem, elaboration of mathematical models, choice of mathematical methods for the solution of extreme problems.

In all phases the engineers need scientific and technical information obtainable from different sources: periodicals, books, monographs, manuals, papers of conferences, symposia and meetings, patent descriptions, catalogues, price-lists, standards catalogues, as well as from unpublished sources /scientific and technical research reports, project papers etc./. This wide range of information sources presents one of the peculiarities of the information needs of the engineering force.

The results from the analysis of information needs, arising in the process of creation of engineering objects, determine certain of the tasks of the information work concerning the engineering force

One of the basic tasks is the most possible utilization of the scientific and technical information, since all stages of designing, construction and research work, connected with the engineering objects, depend on the fullness of the necessary information. In order to improve the rate of utilization of the information available by some given time, it is necessary to assess the possibility and feasibility of providing an "information defence" of the themes and drafts of concern. Moreover, the corresponding information body should be responsible alongside with the designers for the possible deficience, resulting from the fact that at the very beginning of research or construction the available scientific and technical information hasn't been taken full into consideration.

The full utilization of the scientific and technical information will save the time and money, unnecessary waisted for doubled research and development work. The difficulty in the full utilization of information lies in the necessity to provide inter-field, complex information for the engineering force. Nowadays it is impossible to make feasible engineering solutions without technical and economic grounding. Such solutions require the application of economic mathematical methods and multiversion modeling. These solutions include the definition of economic criteria, choice of mathematical methods for extrem problems atc, and thus are closely connected with the information availability.

The other task of the information activity is connected with the necessity of the building-up of information files, required from engineers by the elaboration of the standard-type technical objects. The dynamic character of the engineers' information needs is shown by the demand for different information at the different stages of the project

development. The corresponding bodies for scientific and technical information have to study the standard-type stages of the creation of technical objects and the peculiarities of information needs at such stage. In this way they will be able to provide the engineering staff with thorough and timely information. This will create the prerequisites for an adequate structure of information files and shorten the time for the information to be send to the users.

A very important problem is to deliver information ready for use. By the design of modern technical objects the engineers have to use an immense quantity of information, concerning various spheres of man's activities. The more complicated the designed object is, the bigger the volume and broader the scope at the information required. To find out this information, to analyse and generalise it requires great physical and intellectual efforts. But because of time shortage, lack of specialised knowledge and habits, such work turns to be beyond the capacity of the single engineer. At that moment the body for scientific and technical information has to help him. To satisfy timely the various information requirements of the engineers, those bodies must constantly pile up, classify and generalise the numerous information items, deriving technical activities and production, as well as arrange those items in a way most suitable for use, i.e. in diagrams, graphs, tables, filing cases, etc. Besides that they have to provide general and review information for the engineers, as for the state and the tendencies in those fields of technics, to which the engineering objects belong. Such review information in many cases determines the starting direction of the engineers' work. This means that because of the specificity of technical objects and the processes of their creation /needs for complex, multi-branch oriented information, possibilities for elaboration of competitive models, time-limits for their construction, etc./ the sceintific and technical information bodies in service for engineers have to analyse and generalise the information much more than information bodies, working for scientists.

One of the most important problems will always be to shorten the time needed for processing and transmitting the information to the users. For engineers this problem is connected with the necessity to accomplish the creation of technical objects in fixed terms.

The solution of the basic problems given above is realised in various ways. For scientists, the main sources of information will for long time be again the information publications of different kind and purpose, as for example bulletins for single information and abstract journals. To a more important role are turning the information reviews comprising critical evaluation and generalization of the scientific and technical data.

More serious requirements are made towards the information publications with respect to their complexity and fullness and the time-limits for their preparation. Each scientist or engineer needs scientific and technical information to cope with his individual requirements, related to the problems he has to solve.

Principally new methods are needed for grouping or distributing the sources of scientific information according to various combinations of indicators in order to provide for any needed complex of information sources and services. These methods find their realization in the integrated information systems, which allow for the repeated and multi-aproach use of scientific papers for various unformation purposes after only one-time analytic-synthetic processing of the papers. The automated integrated information systems will substantially raise the efficiency of the information services to scientists and engineers and will as well speed up the application of scientific achievements in production.

INFORMATION BACK-UP OF ENGINEER'S ACTIVITIES

G. Pospelov, USSR

Introduction

In his report delivered at the 25th Congress of the Communist Party of the Soviet Union, L. I. Brezhnev ranked the task of a speedier development of science and technology among the key issues of the national economic development today. As L. I. Brezhnev noted, this issue was also high on the adgenda of the previous 24th CPSU Congress. The main directions in the national economic development for 1976-1980 suggest that the adoption of research results in industry and the integration of science and production and, hence, the integration of scientific-technical and production-economic planning be considered as a top-priority matter in line with the course towards the intensified development of production and also because the tenth five-year period is the period of struggle for higher quality and efficiency of production. Decisions of the 25th Congress of the CPSU will undoutedly exert a guiding effect on the development of the state scientific and technical information system (SSTIS) in the USSR and make one look at its efficiency under a different angle, taking into account of the propositions put forward by L. I. Brezhnev.

Information support for engineer's activities in the USSR is a function of scientific and technical information systems integrated into the state scientific and technical information system. Scientific and technological progress has led to a sharp reduction in the duration of utilising results and achievements of natural sciences in the applied and engineering spheres. Besides, at the past annual session of the USSR Academy of Sciences, its Rules have been amended, with emphasis on conducting fundamental research on the most wide scale. Under these conditions any isolation scientific of information from engineering information, of which there some proponents among information officers, should be considered erroneous. This, however, does not mean that engineering and scientific information has some specific problems, particularly when information users themselves are considered

Today, the constantly developing state system of scientific and technical information for engineers embraces 11 All-Union centres, approximately 70 intersectoral centres, more than 80 sectoral and 15 republican research institutes receiving information from almost 10,000 local scientific and technical information departments and bureaux. Besides, the dissemination of scientific and technical information and engineering knowledge is a responsibility of scientific and technical societies (STO) established in various sectors of the national economy. All 23 STOs have a common supervising body – the All-Union Council of Scientific and Technical Societies (ACSTS) – and rely in their work on 2,096 republican, territorial and regional NTO's management boards. All the societies, their central and local boards have, as a rule, commitees or commissions on scientific and technical information working under the guidance of the ACSTS's Scientific and Technical Information Committee and rely in their activities on the Public Bureau of Scientific and Technical Information at industrial enterprises, research institutes and design offices.

Scientific and technical information (STI) systems, both state and public, well complement each other because automated STI systems are mainly documentary systems containing the following information on each scientific and technical document:

- indexes to subject headings' divisions under which a given document is cited:
- indications about type of document (journal article, patent, monograph);
- document's title in the original and/or in translation into Russian;
- names of all authors of a document;

– imprints;

– language in which a documents is written;

– list of all the keywords or discriptors which, when taken together, are representative enough of the main idea or subject of a document, and are, hence, a document's search pattern; and

– annotation or abstract of a document.

This information is supplemented with UDC numbers, indexes of national patent classification schemes, etc.

Under these conditions the factographic and analytical processing of documentary information necessary for creative activity of engineers becomes the task of information users. And it is among the information users that members of public bureaus of scientific and technical information can be found. The bureaus' efforts are mainly aimed at the analysis and factographic processing of information. Activities associated with this operation are sometimes called the active form of disseminating and utilising scientific and technical information services provided by documentary IR systems which in this sense are passive information dissemination tools.

Let us now consider specific aspects of providing information support for engineers.

The engineer today performs a wide range of diverse tasks. Besides the division of engineers into different professions: mechanical engineer, electrical engineer, civil engineer, chemical engineer and even engineer-physicist (the last profession has the official status in the USSR), in the past decade they became subdivided within each of the professions by fields of specialisation into research engineers, design engineers, test engineers, process engineers specialising in production management, etc. In all cases, however, the engineer is a specialist with a higher technical education who by virtue of his profession must be active in manifesting his intellectual abilities and inventiveness. Even the term "engineer", which came from Latin "ingenium" i.e. "wit, inventiveness", obliges him to be so. One more gradation in the engineer's activity should also be mentioned here. All higher school graduates in the USSR are more or less narrow specialists in a particular field of knowledge or activity. With time, however, many such specialists due to the accumulated knowledge and practical experience and, perhaps, also due to advance training become promoted in their service hierarchy and turn into so-called generalists, i.e. capable of working as a manager in a particular field of technology or research. Incidentally, the experience has shown that the share of engineers becoming generalists, including science managers, is considerably greater than that of researchers. The diversed character of engineer's activity gives rise to different types of information services. For any engineer's profession one may single out the following spheres of activity requiring a special approach to information support policy:

(1) Design and development of new technology. Engineering and inventive work.

(2) Pilot and experimental production.

(3) Technology and control of discrete processes in machine building, including small-scale, serial, and mass production.

(4) Technology and control of continuous production in chemistry, petroleum processing, cement industry, etc.

(5) Operation and maintenance of equipment and systems.

In all the spheres of engineer's activity mentioned above, information support should be provided in accordance with the specific requirements of executive and managerial staff composed of different level of engineers and technicians (generalists). Here I would like to describe how information services are provided only in the first spheres of engineer's activity which may be considered as a decisive factor of scientific and technological progress. Hereinafter I shall discuss the matter covering:

(1) various features of scientific and technological progress and a so-called information explosion connected with it;

(2) information support for design and development of new equipment, including computer-based design systems;

(3) prospects and new opportunities for information support of engineer's activity, which now appeared due to achievements in the field of "artificial intelligence" (cognology).

1. Scientific and technological revolution and "information explosion"

The most important feature of scientific and technological revolution is the rate of renewal and expanding of the nomenclature of products manufactured or as economists sometimes call it, renewal of the component of the commodities and services vector. Renewal of the products nomenclature is due to the use of scientific discoveries and innovations. The process of transforming research results into new types of products K. Marx aptly called the process of knowledge materialisation. Thus, the rate of knowledge materialisation is a component part of scientific and technological progress.

The steadily increasing tempo of scientific and technological progress can be demonstrated by a shorter time lag between the appearance of a soundly-based idea proving a possibility of creating a something new and a large-scale adoption of this novelty in various sectors of the national economy. Thus from the time when the principle of obtaining a photographic image was first discovered (1725) to its practical implementation 100 years were elapsed; industrial electric motors appeared in 60 years after the principle of their operation had been substantiated theoretically; the radio locator was first manufactured in 15 years after the effect of radio wave reflection had been discovered; transistors appeared on the market in 5 years after the theory of semiconductors had been worked out.

The process of knowledge materialisation consists of several stages: basic research; applied research; contract design projects (preliminary projects); experimental design projects; and the preparation of production and the manufacture of new products.

Scientific and technological revolution leads now and again to the appearance of new classes, subclasses and types of engineering devices and systems for such kinds of technology as automobiles with their subclasses – lorries and cars, the latter subclass in the USSR consists, in its turn, of such types as "Volga", "Moskvich", "Zhiguli", and "Zaporozhets".

The similar hierarchi of classes, subclasses, and types can be found in many other devices and systems (aircrafts, ships, electronic devices, machine-tools, etc.). Engineering systems, in their turn, are represented by specific models being manufactured by industry and used by customers in a particular period of time. A concrete type of an engineering system, not to mention subclasses and classes, is rather stable and long-existing category. Having been manufactured only once, a type of an engineering system continues to develop due to appearance of its new, more and more perfect models. This phenomenon makes it possible to introduce the notion of the life cycle of a model (1) and of its inception and dying, i.e. removal from operation in the national economy or discontinuation of its supply for the market.

The life cycle may be represented by a diagram of the states passed by an engineering system in the course of its evolution. All begins from a conception of a new model, which is brought to life by needs to have a model possessing new, more perfect parameters, on the one hand, and due to opportunities provided by breakthroughs in science, technology, and engineering, on the other hand. At the concept stage, two kinds of information are needed. (1) information on market demands, or to be more exact, information on new tasks, which users of the given technology will have to solve, information on their dissatisfactions with existing models, and (2) information on latest developments in science, technology, and engineering, both in the given and related fields.

The concept stage is documented with draught, predraught, and alternative design projects in the form of either prognostic versions or well-based technical proposals. The concept stage is

the most important and creative phase of design work requiring that necessary data be systematised and structured. How it should be done, I am going to show below.

The next stage of the life cycle is applied and, if needed, basic research projects, draft designs, experimental design work, test, production and marketing, and, finally, as the model will be ageing, taking it out of service and market. If necessary, design should be started at the stage of experimental design work and then capital construction at the customer or user of a new engineering model may be initiated.

Draft design is an important stage in the life cycle. At this stage several alternatives may appear and network diagrams of different design versions are drawn up.

Basic research plays an important role in the advancement of science and technology. It is the primary source of a radical renewal of component of the commodity and utilities vector as well as the basic source of new types of technology. Suffice it to mention many new industries and fields of technology that appeared due to achievements attained in the basic research field (atomic technology and industry, space rocket technology, computer technology, semiconductor and microelectronics, lasers, microbiological industry, new materials, artificial diamonds, etc.). It is basic researches that are source of new original engineering solutions used in devising new technology and new engineering processes. The role of basic researches becomes especially significant if we shall imagine the following experiment. Suppose, for example, that 20 or 25 years ago all research projects dealing with the solid-state physics had been discontinued. In this case, even in the 70's we, evidently, had at our disposal tube electronics and radio engineering. Special importance of basic researches manifests itself in the fact that the share of allocations for it is growing faster all over the world than the total expenditures on design and research.

The rapidly increasing number of new design projects and accelerated development of science and technology in general have led to the appearance of a popular concept of information explosion, which is also much covered in the press (2). To illustrate it, a US journal "News Week" wrote that current documentation of government institutions only amounts to 708,654 m^3 and expenditures for its processing reach 6.10^9 a year. Similar situation is observed in research and industry. But can we really speak about information explosion or it is something else? From our point of view one may speak about an avalanche-like growth or explosion in the number of publications, documents, reports, data, but not at all in the amount of information. The matter is that the term "information" had the same lot as the term "stability" of which American mathematician Belman said in the preface to his book "Differencial Equations" that he will avoid the use of this hackneyed term with an elusive meaning. Many investigators take Shannon's theory of information transfer via communication channels where the unit of measurement is byte for the information theory. Amount of information in Shannon's sense is nothing else as the reverse probability of the event about which information is transferred via communication channels. It is quite evidently that information in this sense has nothing in common with scientific and technical information. This type of information may be defined as that new that is contained in messages. In this sense information can be considered as an increment in its recipient knowledge and as such it has no quantitative measure. Naturally that for different people one and the same message may have different informativeness depending on a recipient's knowledge.

The design engineer in his everyday work has always to solve different tasks, i.e. make engineering decisions and, hence, he always needs new information contained in messages recorded on various carriers (books, articles, reports, magnetic disks, tapes, etc.). Proceeding from the aforesaid, we can define data as messages about particular facts recorded on any carrier. Messages correlated with a field of their application are called knowledge. Messages capable of enriching knowledge of their recipient and serving to solve definite tasks are called information. The fact that specific messages contain information and in what amount can only

be established when a person uses message carriers. The problem, therefore, consists in the way the information the engineer needs for his tasks is extracted from the truely snowballing mass of messages recorded on various carriers with the least expenditures for search and with the maximum stimulation of creating thinking. All this can be attained by the rational use of computer technology. Computer technology makes it possible to fulfil these two tasks by structuring and systematising data to back up solutions of specific problems. Some of the proposals concerning these solutions as applied to design work of engineers will be considered in the second paragraph.

Here it should be noted only that the computer as such stores in its memory data, but not information or meanings, and that the computer processes data, but not information. Therefore, it is correct to say that general purpose computerbased information systems have banks, or data banks. But can we, nevertheless, put a question in this way: can the computer as such store knowledge, but not data alone and by processing them to obtain new knowledge or information? The question can be answered positively. The matter is that the problem of representing knowledge (and not data alone) in the computer is central in the theory of artificial intelligence (cognology). There are several ways of representing knowledge in the computer. The most notable is to use predicate calculus, semantic networks, and structural representations in the form of so called frames. Knowledge representation in the computer determines both new properties of computers and new possibilities of their utilisation. The main new property is a possibility to build in a computer memory a model of the environment or of the external problem medium, and this means that a plan (algorithm) of solving a problem can be compiled automatically on the basis of its formulation and initial data alone. In this respect it would be interesting to compare with one another three stages in the use of computer technology.

Stage 1

Programs and initial data necessary for calculation and data processing are fed into computer memory. The operational system provides for either an on-line or time-shared solution of problems, in the latter case each user inputs his own programs and initial data.

Stage 2

It stipulates the use of computers in information systems and envolves the building up of data banks, elaboration of generalised monitoring systems for data bank (GMSDB), and the establishment of so-called general purpose information systems (GPIS).

At this stage packages of applied programs and job languages as an "addendum" to algorithmic languages. Job languages in this case are highly specialised formal languages meant for end users. Generally, they are languages of tables, formulas, etc. supplemented with programmed phrases of a natural language. A formalised job language is used also in a man-machine dialogue.

Stage 3 (just begins)

This stage just begins and is characterised by input into computer memory of problem medium models (and not just data). This makes it possible to compile a work program for robots and to plan calculation strategies using available sets of computational modules. It is at this stage that knowledge is represented in the computer and, as a corollary, job languages and dialogues in a relatively free natural language are brought into action.

Implementation of a natural-language dialogue is held up due to difficulties encounted in working out a computer-based analysis of texts and speech. All the three problems –

knowledge representation, computer-based analysis of texts and speech, and planning decision making – are of paramount importance today for the successful elaboration of artificial intelligence.

The transition from the second to the third stage is rather complex and will be carried out gradually. Nevertheless, even at the second stage much can be done structuring data to obtain information for engineers. The problem involved will be considered in the next paragraph with special reference to design and development problems.

2. Computer-information support of design and development work

In designing and developing new products, the engineer has always to make decissions. These decisions combine with one another to be embodied in schematic, functional, and gearing diagrams which are then turned into a device and its component parts. In designing a new product engineers generally use from 90 to 95% of already known design versions. A combination of these known design versions with 5–10% of new, original ones determines degree of novelty of a product or an engineering system being devised.

The task at this stage is to supply the design engineer, starting from the concept stage, with adequate data on all design versions of a future product, known in the given field. Such data must be structurally organised or related in the data bank to the corresponding level of a tree (graph) representing the engineering system. Let the system in question be conditionally represented by a six-level tree (Table 1).

Table 1

Level	Name
I	System
II	Complexes
III	Devices
IV	Instruments
V	Units
VI	Parts, elements

At each of the levels starting from the second and downward, each complex of the system and each device of each complex, etc. can be implemented in different alternative versions. Each alternative at each level is either known or new, original design version. Hence, at each level there are several alternative lists (lines) of complexes, devices, instruments, etc. Data on all alternatives for each level form a structured data bank of a system being designed. The existing lists (lines) of alternatives are constantly added with new one due to scientific and technological progress. Design version alternative structured in this way form the "or/and" tree (graph) well-known from the heuristic search theory (3). This "or/and" tree may be called a technological memory of the engineer implemented in the computer. A choice of a particular alternative at each of the levels turns the "or/and" tree into the ordinary "and" tree. This transformation of the "or/and" tree into 'and" tree or into several versions of "and" trees is the essence of intellectual work of the engineer at the concept stage of system design. The transformation of the "or/and" tree into "and" tree continues also after the concept stage. This transformation is an iterative process associated with research, calculations, experiments etc. Most iterations end by the time when production of a prototype model is started.

The technological memory which is constantly being enriched with new alternatives, provides a sound basis for building automated design systems (ADS).

Design involves generally the use of a great amount of varied information. The main task of

ADS – generation of a new device project – is solved during processing this information in the designer-computer system working in the dialogue mode. It is this tasks that determines the general scheme and the software of an ADC information calculation system ADC ICS (4,5). By its parameters this system is comparable to the third stage systems. It contains both an information model of a design object ("and" tree) and a task planner since in the course of design the engineer cannot limit himself to a set of standard tasks only. Software of the ADS's information calculation system consists three parts: a design information model, a design module library, and a library of standard design versions.

The design information model is represented in the computer memory as a totality of objects corresponding to individual parts of a future device. Each object consists of the object's name and a set of fields in which the object's properties necessary for the design (weight, dimensions, material etc.) are recorded. A device generally consists of many interconnected elements. Their interaction with one another can be readily represented in a model by specifying various relations among the objects. Design tasks deal generally with the relation of inclusion which specifies component parts of a given object.

The computational module library includes individual programs which are used at stages associated with design versions synthesis, and with analysis and selection of the final version. At all the stages a library of standard design version prototypes of individual design units is used. The information calculation system is monitored by a specialised operation system (OS ADS). It includes an interpreter of input language instructions (with the help of which the designer orders the system to fulfil a particular part of design process), a computation planner responsible for calling in the necessary modules and for carrying out information exchange, and a unit for queueing output information.

The system uses the List Processing Language (LISP) as its basic language. A design model is represented in the computer memory in the form of LIST's lists which correspond to individual objects and are stored in the main file archive. Various relations among objects are represented in files (structural files of the system) in the form of infrastructures containing local vicinities of vertices of the graphs formed by a particular relation.

This type of recording various relations increases the system's flexibility and enables the information calculation system to be easily adjusted to the solution of concrete clases of problems.

As mentioned above, the system has a computation planner making it possible to plan a problem solution on the basis of individual modules, and language of instructions or jobs in a rigidly limited natural language. Since a list set of objects admits construction of different types of relations, the system can be used not only for design purposes, but also for the design and development system as a whole, as well as in production planning and control systems at various levels of management.

This proves to be possible because, for example, at the stage of production or its preparation the information model of a system in the form of the "and" tree turns again in the "or/and" tree, with alternatives of embracing in the case in question production and not design decisions about organizational and technological aspects of manufacturing, assembling, testing, etc. devices, instruments and other interconnected elements of the system.

3. Development prospects for information support of engineer's activity

As we have already noted, these prospects are connected with achievements in the field of artificial intelligence (cognology) and also with the transition to the third stage in the use of computer technology. In such a case, the information calculation systems of the type we have described above (ICS-ADS) are transformed into information-calculation-logical systems, i.e. the systems having, in some form or other, knowledge representation subsystems and providing

capabilities for a man-machine dialogue in a language similar to natural. One of such systems, DILOS, we shall describe in brief below (6).

DILOS consists of four main units, which are conventionally called processors, and a data base divided into segments for each of the four processors. DILOS is a multipurpose system and can serve any problem area.

Its data basis which has a system archive, is meant for storing thesaurus data, computational module programs, a rule of inference, and other means of data handling in the processors.

End users formulate their requests or set a task in a language similar to natural, using a dialogue linguistic processor (DLP). An arbitrary natural language with a limited vocabulary meant for end users turns at the DLP output into a formalised interface language, or so-called rigid grammer language. Different phrases having the same meaning are represented in this language as identical. End users can utilise, via the DLP, any of the three processors or their combinations.

The information retrieval processor (IRP) provides access to a vast data bank.

The computational processor is used to calculate various types of mathematical models, employing high-level languages, i.e. computational modules (procedural programs) available in the data base. Since in the general case one cannot indicate in advance the sequence in which the modules will operate in solving a problem set by the user, the computer centre staff plan the computational process by forming appropriate strings of computational modules. The logical processor (LP) is the main element of the semantic memory. It is used to build semantic models of the environment included in a given problem area. The semantic model is build on the basis of axioms relating to a given problem area and of rules of inference which make it possible to deduce new facts from both the given axioms and intermediate results. The model is presented in the form of graph whose vertices are concepts characterising particular objects of problem area, and the arcs are relations among these concepts. The graph is used to verify whether a task is put correctly whether it is contradictory, and whether data and software are available to solve it.

In the work of the logical processor one can establish four important functions or operational modes.

These include.

I. Extension and modification of the model data base (MDB)

This mode may be called an instructional mode.

II. Search and answering the request contained in the source message.

III. Computational planning when initial data used in describing results (statement of a problem) with the help of the MDB are taken as the basis for building a sequence of special functions and program modules. This sequence is an algorithm designed to solve a problem which has been stated, but not envisaged in advance.

IV. (Situational) control is applied in cases when initial and target situations, descriptions of these situations, and the available environmental model are used to elaborate a plan of actions of the object (subject), capable of changing the state of the system and its environment up to the case when a target situation can be obtained.

The aforesaid shows that the DILOS system can be built in different modifications or models.

Version a is an imformation retrieval system using a natural language as well as linguistic and information processors only.

Version b is a factographic information system. This version includes all the means stipulated in version a plus a simplified logical processor without environmental model, with the help of which an answer is prepared on the basis of facts contained in the data base.

Version c is an intellectual data bank (IBD). This version uses all means of version a plus a logical processor and a universe model. It offers qualitatively new possibilities as compared to

those of the IR system making it possible to meet requests for which there is no ready information in the data bank. Answers are generated on the basis of data contained in the bank and of regularities (logics) of the universe.

Version d is a computer system using a natural language as the job language. The system employs linguistic and logical processors, as well as program modules. The computational processor semantic network is used to assemble out of modules a more sophisticated computer program.

Version e is the full-fledged version of the DILOS system as it has been described above.

The system implementation requires efforts of system analysts (specialists in applied mathematics, systems analysis, economico-mathematical modelling, etc.) familiar with a particular problem area, and of system programmers. Main functions of the system are presented in the LISP language hospitable to other machine languages, e.g. ALGOL and FORTRAN, and to the compilation of computational modules.

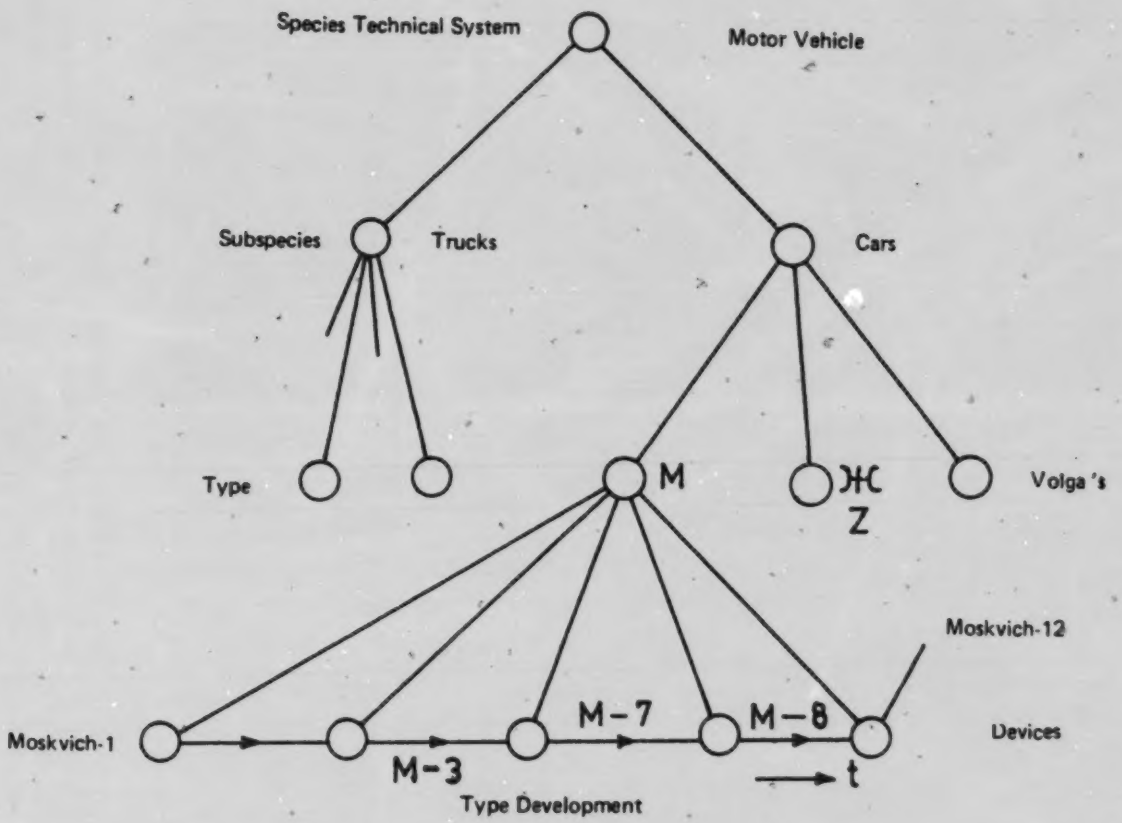
In all cases the system implementation requires the use of an operational system to work with terminals, and a data bank monitoring system, that is all the requisits possessed by the present-day general information systems.

From the aforesaid extremely important conclusions ensue, which consist in the following. We determined information as data necessary for engineers to solve their tasks, this means that there is a need for searching, channelling and structuring data to solve particular tasks, i.e. a need for transforming data into information. Today this operation is generally performed by users themselves despite a large-scale use of computers in scientific and technical IR systems. Since most IR systems today are documentary systems the building of which continues within the framework of the library science tradition, it is but natural that the task of transforming data, obtained from such systems, into information is shifted on to the user. In such a situation things will remain unchanged whatever effort we may channel to user education and training. In this work we tried to show how this state of affairs may be remedied and how data can be converted into information with the help of computers, but namely with the help and not automatically. From what we have said above one more conclusion follows. It is unlikely that the independent development of computer-based scientific and technical information systems will be sufficiently effective. Therefore, the integration of automated scientific and technical information systems with automated systems for solving engineer's tasks should be persistently recommended.

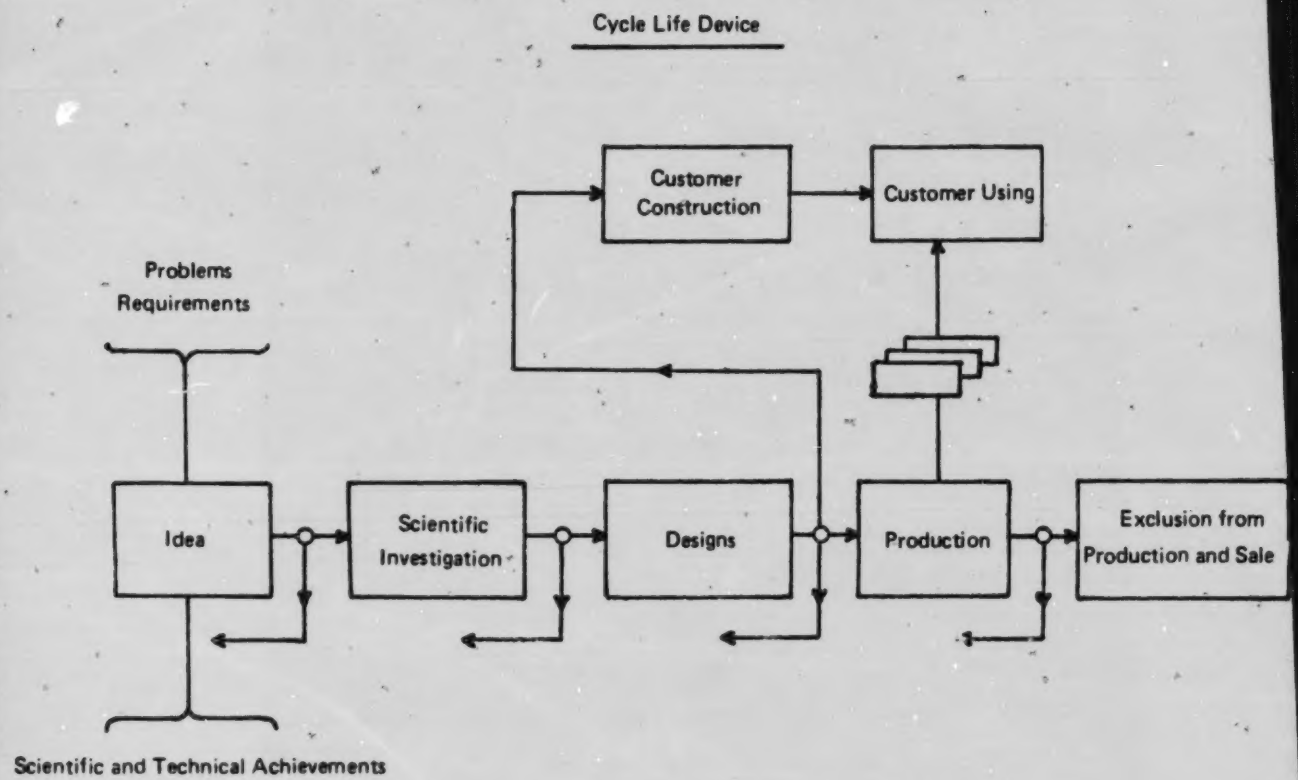
References
(In Russian)

1. Pospelov G. S., Irikov V. A. Goal-programming planning and management. "Sovetskoje Radio", 1976.
2. Chernyak Yu. "Was there the information explosion? " , Znanie-Sila, No. 3, 1975.
3. N. Nilson Artificial Intelligence (Translated from English). Mir Publishers, 1973.
4. Mazurik V. P., Medvedev A. E., Sushkov B. G. An information-calculation system for a computer-based design. Trudy XX Nauchnoj Konferentsii MFTI. Seriya: Aerofizika i Prikladnaya Matematika. Part II MFTI. Dolgoprudnij.
5. Mazurik V. P., Medvedev A. E., Sushkov B. G. Operational system for a computer-based design. Voprosy Nauki i Tekhniki. Seriya ASU. No. 2/8, TsNIIATOMINFORM, Moscow, 1975.
6. Bryabrin V. M. The conversational logical information system (preprint). AS USSR. Nauchnyj Sovet po Kompleksnoj Probleme "Kibernetika", Moscow, 1977.

ANNEX 1

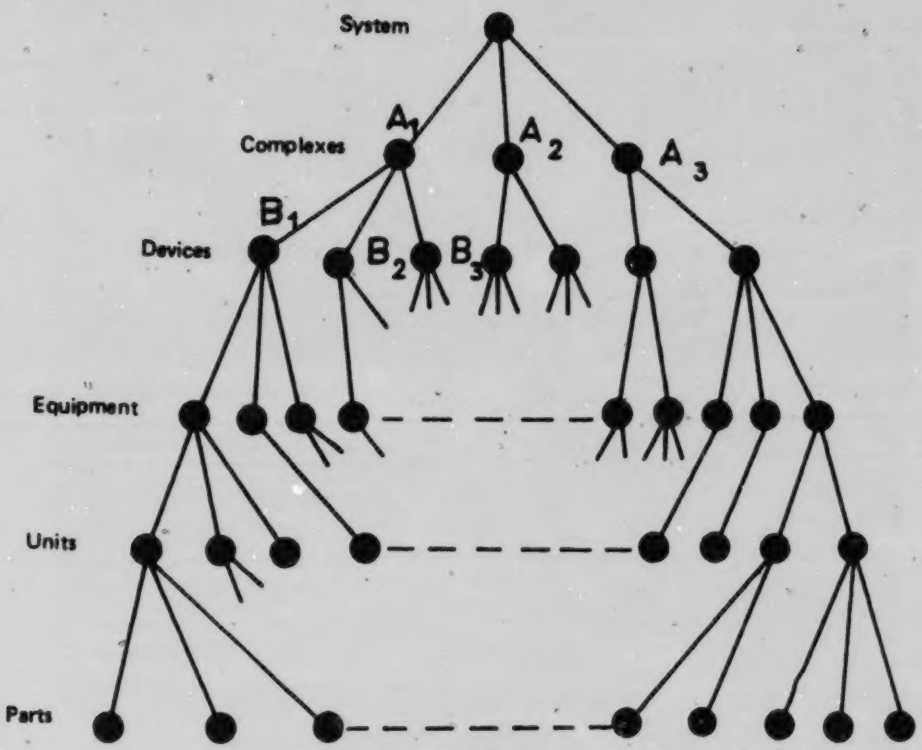

Species Technical System
Motor Vehicle
Subspecies
Trucks
Cars
Type
M
Volga 's
Moskvich-12
Moskvich-1
M-7
M-8
Devices
M-3
t
Type Development

ANNEX 2


Cycle Life Device
Customer Construction
Customer Using
Problems Requirements
Idea
Scientific Investigation
Designs
Production
Exclusion from Production and Sale
Scientific and Technical Achievements

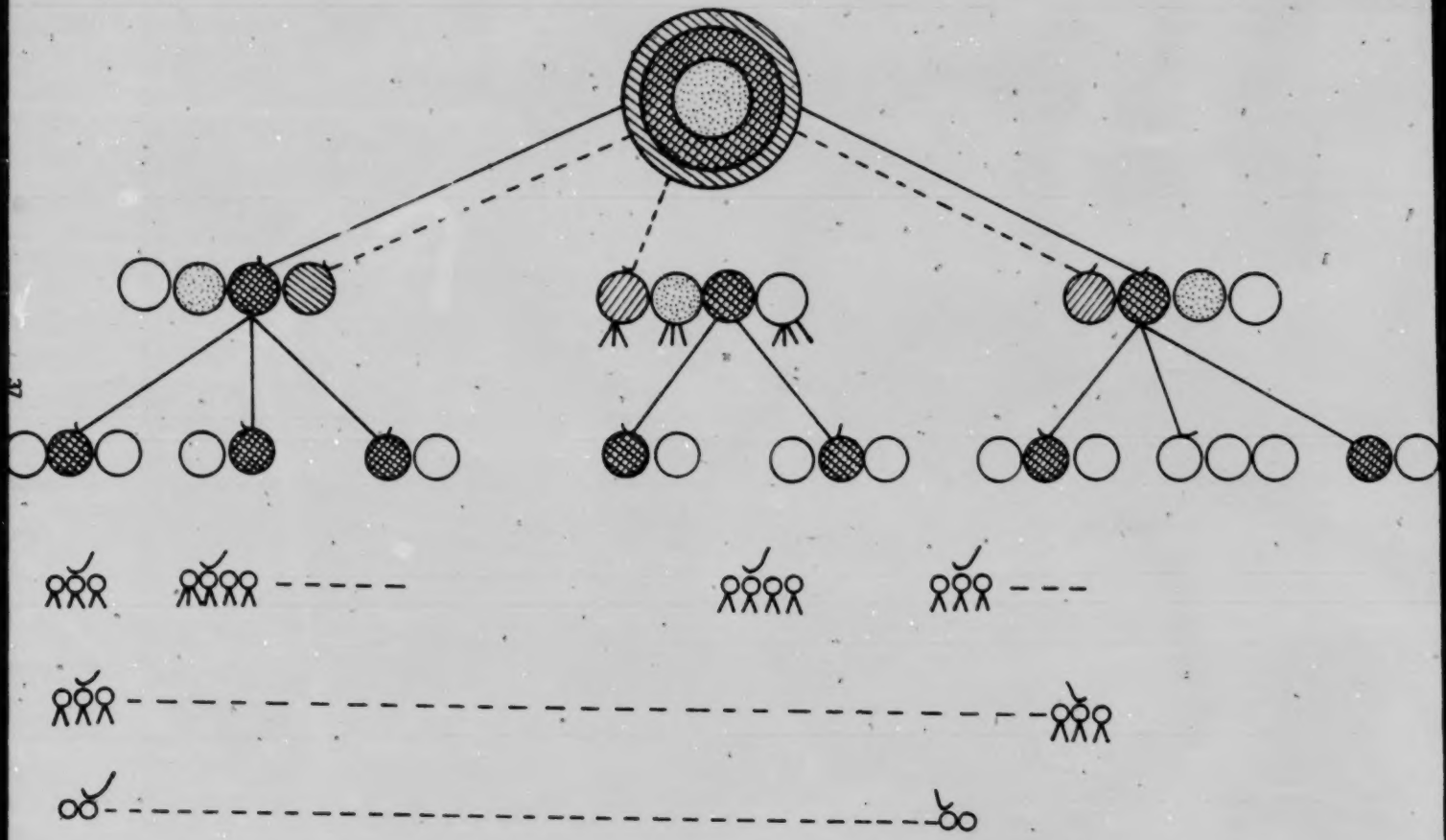
ANNEX 3

Tree "and"

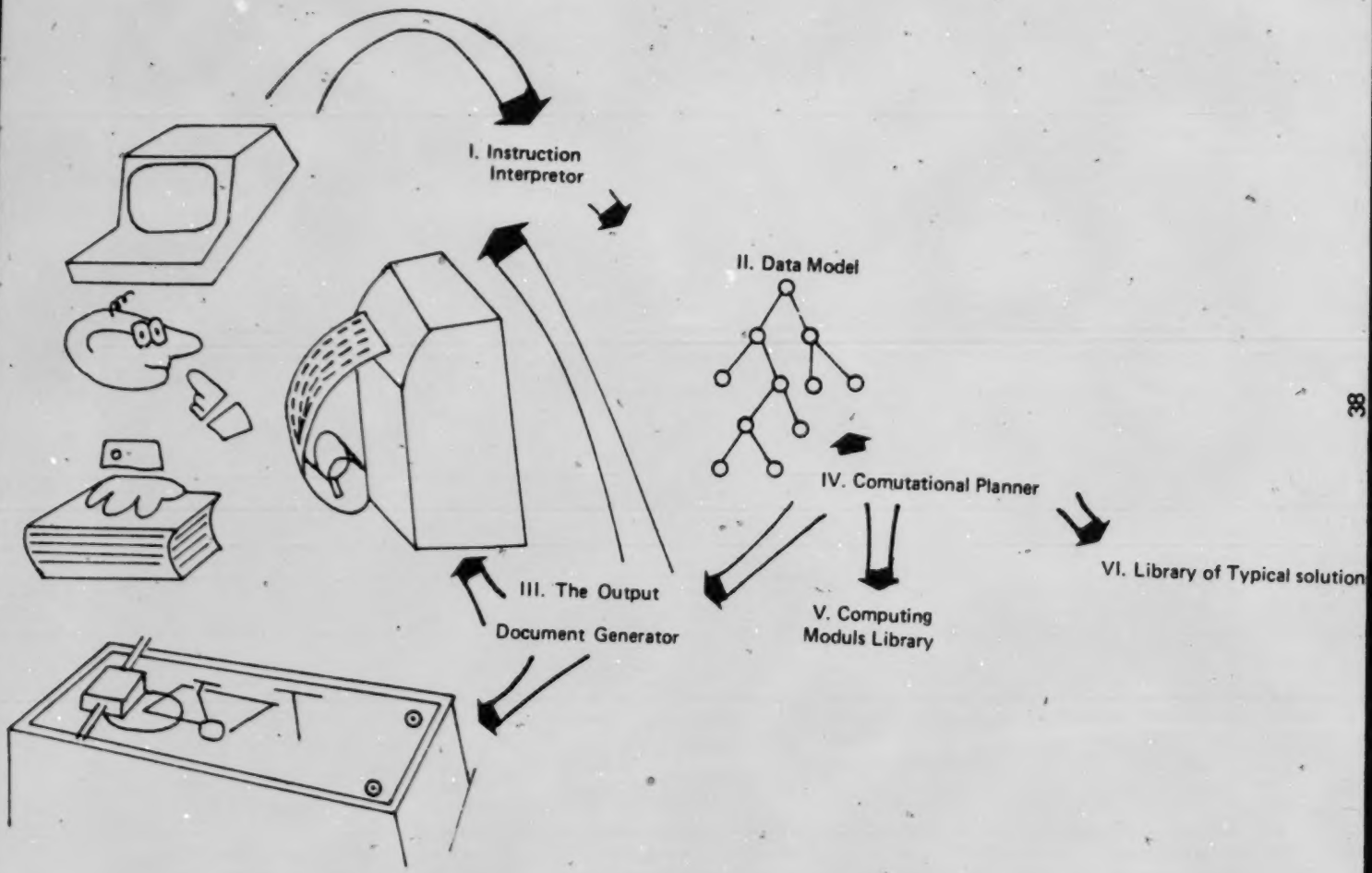


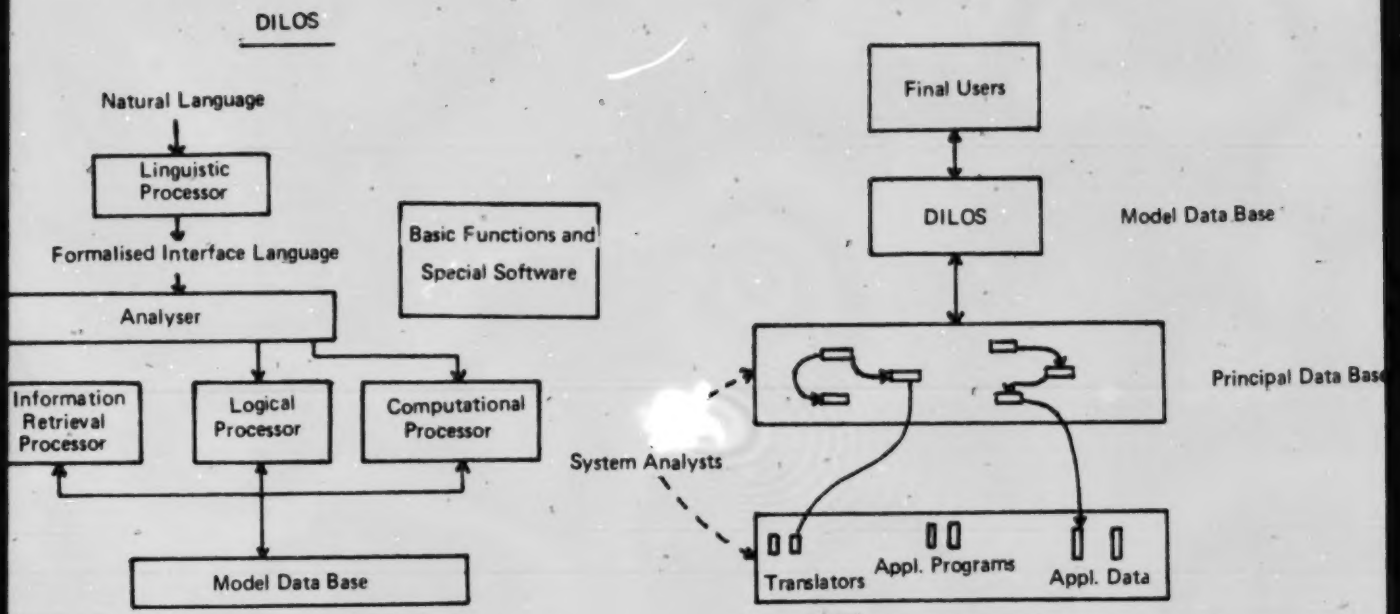
ANNEX 4

Tree "or/and"

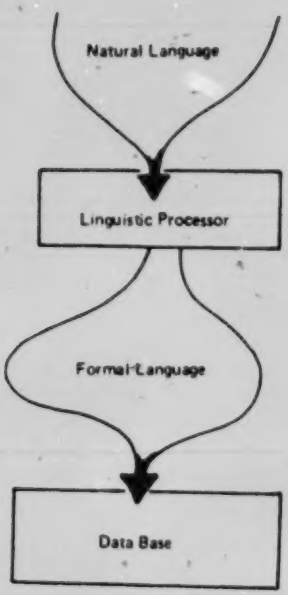


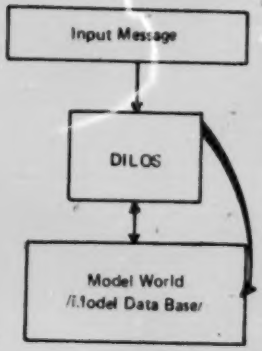
ANNEX 5


I. Instruction
Interpretor
II. Data Model
IV. Comutational Planner
VI. Library of Typical solution
III. The Output
Document Generator
V. Computing
Moduls Library

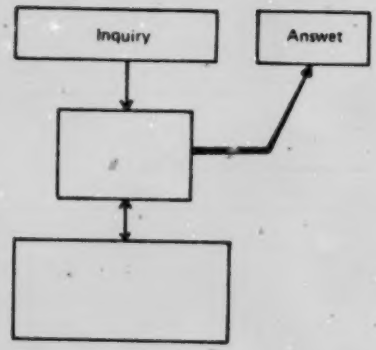

DILOS
Natural Language
Linguistic Processor
Formalised Interface Language
Analyser
Basic Functions and Special Software
Information Retrieval Processor
Logical Processor
Computational Processor
Model Data Base
Final Users
DILOS
Model Data Base
Principal Data Base
System Analysts
Translators
Appl. Programs
Appl. Data

ANNEX 7



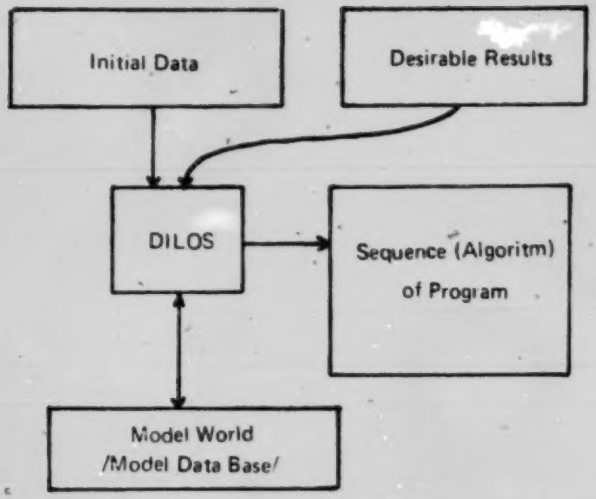


a. Model Modification

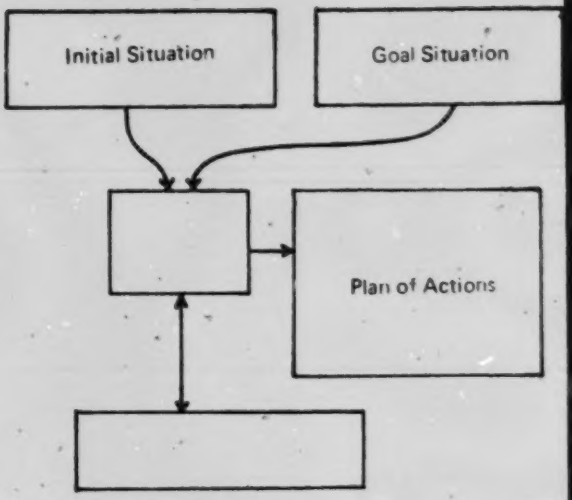


b. Question – Answering

ANNEX 8



c. Calculation Planning



d. Situation Control

INFORMATIONS ET DONNEES SCIENTIFIQUES ET TECHNIQUES POUR LES INGENIEURS

A. David, FRANCE

Par son expérience et par la formation qu'il a reçue, l'ingénieur est particulièrement apte à comprendre les connaissances scientifiques et techniques et à les utiliser pour la pratique de son métier: exécuter les tâches qui lui sont confiées dans le cadre des fonctions qu'il assume dans l'organisme où il travaille.

Il s'ensuit que les informations et données scientifiques en tant qu'élément de connaissance, sont étroitement associées aux tâches et activités des ingénieurs.

De ce fait, les informations utilisées dépendent:

- de la nature du travail
- de son état d'avancement
- de la capacité à s'informer et à les exploiter de l'ingénieur qui les utilise.

De plus, elles n'ont pas seulement un caractère scientifique et technique, mais comprennent des informations économiques, réglementaires, juridiques. Toutefois, nous ne considérons ici que les premières.

Ainsi, pour l'ingénieur, il s'agit d'un outil et d'une matière premiere pour son travail. Il veut donc des informations adaptées à ce qu'il fait et qu'il puisse utiliser.

Mais pour cela, étant donné la variété, la variation et aussi la spécifité des tâches que remplissent les ingénieurs, l'on est amené à se poser les questions suivantes: peut-on avoir une vue d'ensemble des tâches possibles, et par suite des informations utiles, afin de mettre en place les moyens d'information nécessaires, ou tout simplement afin de pouvoir juger la valeur d'usage de ceux qui existent.

Le probleme est évidemment très complexe.

Pour aider à l'appréhender, je voudrais proposer un schéma de réponse à ces différentes questions et donner en annexe la référence de documents susceptibles de le compléter et de le préciser selon les cas.

Des informations – Pour quels utilisateurs?

Une tâche donnée, et par suite, les besoins correspondant d'information, se définissent par:
l'objet
le but
le contexte

Objet

Les utilisations possibles intéressent tous les secteurs de l'activité, et non pas seulement ce qui est traditionnellement appelé "les sciences de l'ingénieur". Elles intéressent également les connaissances scientifiques de base. Une application déterminée concerne en général plusieurs de ces secteurs. De sorte que la recherche des informations nécessite d'explorer un ou plusieurs secteurs de connaissances et se trouve ainsi facilitée s'il existe des regroupements préalables d'informations par secteurs.

Nous avons de cette façon une première facette de classement des informations utiles (Schéma 1).

But visé

Indépendamment de son objet, le but visé en exécutant un travail, est fonction des activités et des objectifs de l'organisme dans lequel ce travail est réalisé. A cet effet, nous proposons de ranger les organismes par objectifs, et les activités de chacun par fonctions.

Nous avons ainsi une seconde facette du classement des informations utiles. Nous la représentons sur le schéma 11. Dans chacun des cas de figure (fonction, organisme) les informations utiles diffèrent. Ce schéma permet de guider dans les informations à prévoir, selon les objectifs que l'on se fixe, ou encore de fixer des priorités dans les moyens d'information, en fonction des priorités de l'organisme, du pays, de la région.

Contexte

L'on entend par là le cadre géographique, politique, social, économique dans lequel un organisme utilise les informations. C'est ainsi que deux organismes travaillant dans le même domaine, pour les mêmes buts, auront des besoins très différents d'information, s'ils se trouvent par exemple dans des pays dont le développement est différent.

Une troisième facette de classement des informations utiles, est le contexte dans lequel elles servent.

Nous voyons ainsi que les informations scientifiques et techniques pour les ingénieurs ont à considérer sous trois facettes qui, regroupées, donnent une représentation de l'ensemble de ces informations: secteurs de connaissances – finalité pour l'organisme utilisateur – environnement des activités de l'organisme utilisateur.

En conséquence, un besoin d'information est caractérisé par chacun de ces aspects et se définit par leur superposition.

Où se trouvent les informations nécessaires à un travail déterminé?

Un besoin d'information étant caractérisé, la deuxième démarche est d'identifier les sources utiles, c'est à dire les supports de ces informations. Il s'agit, soit de supports où elles sont "figées", ce sont les documents – soit de supports vivants: les hommes qui détiennent les informations.

Or, dans la plus grande majorité des cas, les informations répondant à un besoin défini, proviennent à la fois de documents et de sources vivantes, dont la nature dépend du but visé. Nous le montrons sur le schéma III, dans le cas de deux types d'organismes, consommateurs privilégiés d'informations scientifiques et techniques: les entreprises, les instituts de recherche.

Ce schéma permet à l'utilisateur de choisir les moyens d'information qui exploitent les sources qui lui sont utiles et l'aide à guider sa recherche en l'orientant vers ces sources là.

Il permet aussi, pour la mise en place des moyens d'information, de choisir les sources à explorer en fonction des priorités et des objectifs.

Ce choix étant fait, la question qui se pose alors pour réaliser les moyens, est l'accessibilité.

A quelles conditions les informations utiles sont-elles utilisables?

Etant donné que les informations recherchées sont essentiellement pour l'ingénieur, un outil et une matière première, celui-ci demande d'avoir:

- la sécurité de disposer des informations qui lui sont vraiment nécessaires;
- une accessibilité qui lui permette de les utiliser;
- une économie de son temps et des dépenses à engager.

Ce sont là les trois paramètres qui caractérisent la valeur d'utilisation des moyens d'informaation, ou inversement la nature des moyens à mettre en place selon l'usage que l'on veut en faire.

En effet:

Sécurité – Cette condition nécessité d'être à même d'explorer les sources utiles dans les secteurs concernés par le travail à faire, et en fonction du but visé. Ceci demande à l'utilisateur de connaître les moyens d'information possibles et de savoir les choisir en fonction des sources d'information qu'il explore.

Accessibilité: Le tableau précédent met en relief les difficultés d'accès.

la variété des sources nécessite un travail d'identification et de collecte;

la nature des sources nécessite d'identifier les informations utiles, de façon à pouvoir les retrouver si l'on en a besoin;

la destination des informations nécessite d'adapter les informations recherchées à l'utilisation que l'on en fera;

le goût, la capacité et les habitudes du "consommateur" d'information, nécessite une adaptation à ses possibilités.

L'utilisateur a besoin dans ce cas, de catégories les moyens qui lui sont accessibles, et d'être capable de définir des besoins d'information

Economie – L'Ingénieur a un double souci:

– économiser son temps, et éviter de consacrer à la recherche d'information plus de temps qu'il n'en faut pour le travail à faire;

– économiser les dépenses entraînées par la recherche d'information, c'est à dire éviter que les dépenses soient disproportionnées par rapport à l'utilisation qu'il en fera.

Le service d'information a, en ce qui le concerne, la même préoccupation: adapter l'importance du travail à fournir à la nature de la demande.

Ainsi, l'ingénieur accepte d'utiliser les moyens qui lui permettent d'être informé à condition qu'ils lui donnent la sécurité qu'il recherche, qu'il puisse les utiliser dans le temps dont il dispose, et au prix qu'il est possible de payer.

Il est bien évident que, selon la nature des tâches et les conditions d'exécution, ces facteurs diffèrent. Le chercheur qui engage une recherche a besoin d'une plus grande sécurité de détenir toutes les informations utiles que le même chercheur qui cherche à se mettre au courant.

De la même façon, le chercheur qui engage une recherche, accepte de consacrer une partie notable de son temps de travail à rechercher des informations – alors que le directeur qui devra décider d'une application de la recherche, exigera d'avoir à portée de mains les éléments de la décision.

En d'autres termes, la valeur d'usage des différents moyens d'information, varie selon les utilisateurs et l'utilisation qu'ils en font.

Comment alors définir dans chaque cas, les critères d'utilisation recherchés, et choisir en conséquence les moyens d'information?

Valeur d'usage pour les ingénieurs des différents moyens d'information

Sur le schéma IV, nous représentons les quatre catégories principales de moyens d'information. Ils se caractérisent par:

– le degré de disponsibilité des informations contenues. Nous les avons rangés par ordre croissant d'accessibilité.

– le domaine d'intérêt et les catégories de supports traités (ouvrages, périodiques, adresses de firmes, de spécialistes...), c'est à dire le contenu dont dépend la sécurité de l'utilisateur.

– le coût de mise en oeuvre et de fonctionnement pour le producteur

– les tarifs pour l'utilisateur

– le temps d'utilisation selon l'organisation et selon la distance qui sépare le moyen de l'utilisateur.

C'est ainsi que les systèmes on-line réduisent les temps d'utilisation en évitant les déplacements: le moyen d'information est à portée de main de l'utilisateur.

Le cadre proposé par le schéma IV permet de guider en fonction de ces paramètres, dans le choix:

– soit des moyens d'information à utiliser

– soit des moyens à mettre en place.

Mais ce choix demande que l'ingénieur, en tant qu'utilisateur, ou que l'ingénieur en tant que réalisateur, ait une compréhension de ces facteurs, connaisse les moyens d'information et leurs caractéristiques, et puisse en conséquence choisir ceux qui lui assurent un coefficient de sécurité, d'accessibilité et d'économie acceptables pour l'utilisation qu'il veut faire des informations obtenues par ces moyens.

En conclusion

L'approche que je propose pour considérer dans leur ensemble les informations et données scientifiques et techniques pour les ingénieurs, permet de guider:

– ceux qui ont à étudier et à décider de nouveaux moyens d'information: domaine à couvrir, sources à explorer ou à utiliser, niveau et élaboration des informations à prévoir;

– les ingénieurs dans le choix des moyens disponibles à utiliser.

Toutefois, dans ce cas, pour que le choix soit possible, il est nécessaire

– soit que l'ingénieur ait reçu une formation adéquate, ainsi que je l'ai montré.

– soit que l'ingénieur puisse faire appel là un intermédiaire, tel que "officier de liaison", service d'orientation, centre d'information. Mais dans ce cas, c'est cet intermédiaire qui doit avoir reçu une formation suffisante, faute de quoi l'ingénieur diminuera sa sécurité et augmentera les frais de recherche.

References

1. UNESCO–UNISIST
   UNISIST Seminar on the Education and Training of users of scientific and technological information.
   ROME, 18–27 oct. 1976
   Final Report, Note UNESCO roneo, 100 (SC–77 / WS / 22)
2. UNESCO–UNISIST
   UNISIST Ad hoc Committee on Education and Training Policy and Programme (Second Session).
   PARIS 19–21 Mai 1976
   Final Report; Note UNESCO roneo, 11 pages + 6 annexes (SC 76/Conf. 666/Coo. 16).
3. P. LAZAR
   Assessment of Information Needs and Resources.
   Communication à laConférencesur la planification nationale et régionale des systèmes et des services d'information scientifique et technologique pour le développement des pays arabes.
   Tunis Avril 1976.

4. Internationale Conference on National and Regional Planning for Scientific and Technological Informations Systems and Services for Development in the Arab Countries. Recommandations (not publishied).
5. MOISSE (E.)
Costing Information in an independant Research Ooganisation.
The Information Scientists 10 (2) Juin 1976 – pp. 57–68
6. GANZ (C)
The education of users of scientific and technical Information.
Information HOTLINE; Juil.–Août 1976, pp. 18–21
7. CODATA
Feaseability Study of a World Data Referral Center.
Rapport CODATA – fév. 1976.
8. DAVID (A.)
Rôle des Centres spécialisés pour favoriser l'utilisation des réseaux de téléinformatique.
Communication au Colloque CNRS "Nouveaux accès à l'information: bibliographie et téléinformatique".
Paris Mai 1977.
9. DAVID (A.)
Données utiles aux Ingénieurs. Nature, moyens d'accès, Difficultés.
Communication à la 5ème Conférence Internationale de CODATA
Boulder (Colorado) juin–juil. 1976.
10. VDI
Final Report on the WFEO Survey on the Utilisation and Sources of Engineering Data by R. HARTH and G. HESS.
Note roneo CEI (FMOI – EI(75)3 1975 55).
11. UN
Office for Service and Technology.
Report of the Expert Group on Information – Exchange and the Transfer of Technology
Vienne Avril 1976
Publication UN 22 pages.
12. EICHER (L.D.) – DAVID (A.)
Determining Engineer' Need for Scientific and Technical Information Rapport au "Committee on Engineering Information" of the WFEO.
Note interne 19/1974.
13. FAIBISSOF S. et ELY D.
Information and Information Needs
Information Reports and Bibliographies, Vol. 5, No 5, 1976.
14. DUCAS M., DAVID A., REINHART M.
L'Ingénieur et l'Information
1 vol. 150 p., 1975, NRT Ed.

Schéma I

CATEGORIES DE DONNEES SCIENTIFIQUES THERMIQUES

SCIENCES FONDAMENTALES

..... MECANIQUE PHYSIQUE CHIMIE BIOLOGIE SC. NATURELLES .....

TECHNIQUES IND.

Industries EXTRACTIVES
" ENERGETIQUES
" ELECTRONIQUES
" CHIMIQUES
" AGRICOLES ALIMENTAIRES
"
"
"

SECTEURS INTER DISCIPLINES

MESURE ....CONTROLE

SECURITE ENTRETIEN

TRANSPORTS CHAUFFAGE....

ENVIRONNEMENT

48

Schéma II

SCHEMA POUR IDENTIFIER la CATEGORIE d'INFORMATIONS SELON la DESTINATION

Organisme / Finalité	Entreprise	Institut de Recherche	Administration	Organisation Internationale	Etablissement Enseignement Information
Décision					
Etude					
Réalisation					
Conseils					
Information					
Mise au courant					

Schéma III

EXEMPLES DE SOURCES D'INFORMATIONS UTILISEES SELON DES BESOINS DIFFERENTS

Destination des informations	Catégories de sources	SOURCES FIGEES: DOCUMENTS												SOURCES VIVANTES: HOMMES								
		Manuels	Ouvrages	Périodiques	Réglementation	Norme	Brevet	Congrès	Catalogues	Recherches	Plans	Statistiques	Etudes	Ministère	Entreprise	Office	Syndicat	Labo	Insituts	Spécialiste	Org. International	Banque
OBJECTIF	FINALITE																					
INSTALLATION INDUSTRIELLE	Décision			+	+		+		+		+	+	+	+	+					+		+
	Etude		+	+		+	+	+		+								+	+	+	+	
	Exécution	+	+		+	+			+						+		+			+		
	Conjoncture			+	+	+		+	+		+									+		
RECHERCHE	Décision			+			+	+		+			+				+	+				
	Etude	+	+	+	+				+	+		+		+	+		+	+				
	Conseils																					
	Information			+				+							+			+	+	+	+	
	Conjoncture			+			+	+		+								+	+			

Schéma IV

GRILLE POUR LE CHOIX DES MOYENS D'INFORMATION

Critères d'utilisation / Moyens d'information		Sécurité	Accessibilité	Economie	
				Temps utilisation	Dépenses
Biblio-thèque	Manuelle Automatisée				
Centre analyse	Manuel On-Line				
Centre d'information (Banque d'informations)					
Banque de données	Manuelle Automatisée on-line				

USER-ORIENTED INFORMATION SERVICES FOR ENGINEERS

K. K l i n t ø e, DENMARK

Discussing information and its users in the World Federation of Engineering Organizations – especially within the framework of information requirements of engineers – makes it relevant to pose the questions – what is the role of engineers in the flow of information and – what kind of information are we talking about?

The questions call to mind the Greek myth about PROMETHEUS – the first recognized engineer and information officer – who brought lighting from ZEUS to serve mankind – lightning transformed into fire, heat, energy, illumination and enlightenment.

The author believes that engineers are those having the understanding and the will to transfer and transform ingenious knowledge into steps of practical progress – into improvements and innovations – engineering simply means putting knowledge into operation for serving human beings.

Progress has spread so far that engineering is not limited to technical matters any longer – aspects of economic, marketing, social, legal and managerial nature have to be taken into consideration when evaluating information for furthering of progress – requirements of engineers are for technological information.

The user approach – or more correctly the end-user approach – for technological information services means that all activities are geared to serve the end-user, assisting him in his role of transferring and transforming the ingenious knowledge into steps of practical progress – improvements and innovation.

This calls for a greater understanding and abilities on the part of information officers in identifying themselves with the end-user's environment, role and tasks, objectives, organization, working methods and working conditions. The officer has to realize that ingenious knowledge only proves its value, when knowledge is converted into steps of practical progress – when knowledge is relevant in substance and in form of presentation to the immediate needs and requirements of the end-user.

The officer of a technological information service has to realize that knowledge is an intellectual commodity – raw material – which has to be marketed – not just distributed, disseminated or made accessible, but evaluated, shaped, repackaged to meet the fertile soil created by recognized needs. (fig. 1)

A technological information service may be called an information marketing service, an information service for industry, an extension service – beloved children are given many names – but they are all realizing the same objectives – meeting the users' needs on the users' conditions.

What are the users' conditions?

Scanning the environment in which we live – in which the engineers operate – we make out that all activities are bound to and carried out by organizational entities – ranging in size from one-man enterprises to enterprises employing hundreds or thousands of human beings in one organization. Even a country may be compared with an organizational entity.

Even if, from a practical point of view we classify the enterprises according to their operations, to their products and their services – or we classify them according to fields of disciplines, to sectors and trades of profession – with special needs – we observe them by roles, tasks, functional activities and performances – they have more similarities and differences in the way they are functioning.

Whether belonging to the public sector or the private sector – to the liberal trades, the manufacturing or the administrative sector or they belong to the sector exploiting natural resources, i.e. agriculture, fishing, mining etc., the users of information form entities – they form enterprises.

My concept of an enterprise is not that of a hierachy of specialization and responsibilities – my concept is that an enterprise is a living organism – in so far that its vitality is the synergy performed by the human beings employed by the enterprise. (fig. 2).

The most vital organism I know of is the amoeba – the one-cell organism consisting of a nucleus – comparable to the purpose, the aims and the basic ideas on which the enterprise is established – the protoplasm – the synergy of the capabilities of the personnel – the super-flexible cellwall – comparable to the set of strategies and policies with which the enterprise meets and profits from the opportunities and the constraints in its environment.

What blood and food is for the body, the information is for the mind. To keep his enterprise alert to its opportunities and constraints, the manager has to organize the information flow to ensure that the staff is stimulated, is kept motivated and susceptible to improving their qualifications and competence. No problems are solved, no plans are designed or implemented, no decisions are taken or executed unless the personnel has the capabilities for action.

Management has the responsibility for the optimal utilization of resources available – the physical and the intellectual resources. Technological information is the means for enlarging the capabilities of the intellectual resources. /fig. 3/.

It is my understanding from experience that to arrange a user-oriented technological information service – an information marketing service – calls for a pragmatic approach. What we learn by taking a marketing approach will provide a valuable set of guidelines for confidence in measures to be taken and for a continuous evaluation of appropriateness of objectives, of methods and of means.

There are three categories of enterprises:

A. Enterprises having a staff qualified enough intellectually to be fully aware of the task and responsibility of their enterprise – having capacity in manpower large enough:

– to take actions to learn in detail the structure and trend in expectations of their clients and prospective clients;

– to take actions to know in detail the strength and weakness to be indentified in their own organization;

– to take actions to identify relevant sources of knowledge, to search, exploit and evaluate the information they master to convert into improvements and innovations.

These enterprises do not necessarily need user-oriented information services, but they are just the most busy users of such technological information services – information marketing services.

B. Enterprises having intellectually qualified members in their staff, but in such a small number that they can only less frequently take actions to investigate their market structure or investigate the infrastructure of external capabilities, potential of knowledge, of I&D-services and systems. They use only to a minor extent I&D-services made accesible to them.

C. Enterprises not having intellectual qualifications or capacity for even infrequent actions to acquire necessary information for development and growth. They only survive by having entrepreneurial spirit and lack of conscience of constraint for growth.

Enterprises of category B & C badly need an information marketing service taking actions in marketing:

- technological information as an intellectual commodity – a raw material;
- technological advisory services;
- specialized and multidisciplinary Information, Documentation and Library services relevant to the individual user group;
- R&D services and centers of excellence in various fields of relevance, at the same time as such services – regarding themselves part-time staff members of their prospective and actual clients – are providing:
- assistance in identification and formulation of needs for technological information;
- Question & Answer as well as referral service;
- gathering of information of any kind on behalf of its clients;
- repackaging of information into an appropriate form;
- information analysis (technological or techno-commercial);
- assistance in long-range planning.

What is the information marketing service – its objectives, organization, functions and personnel:

The objectives are:

- to aid enterprises (in any sector and field) in achieving progress in the market and in economic growth by persuading management, staff and personnel to make the most extensive use of existing technological knowledge and of results of science and research;
- to foster critical and selective provision of any kind of information of usefulness to the enterprise – not only from published or indexed records of literature and actual data, but also from any qualified human resource available domestically or abroad;
- to improve and develop methods of an active approach to enterprises establishing confidence, liaison and communication to further the flow and utilization of information, i.e. knowledge.

As to the methods and means chosen to fulfil these objectives – most of them, if not all – are well-known as recognized practice – at least by people experienced in marketing, in management and in communication with human beings – person-to-person. (fig. 4).

The information marketing service (the technological information service) must take its starting point in segmenting its market – analysing and characterizing the chosen market. (fig. 5).

Within the geographical area (the sector of industry, the area of profession etc.) how many enterprises are there – operating in which fields, working with what kind of technologies, at what level, producing what king of products and services, for what kind of markets, with what kind and size of organization, with what set of capabilities?

Within my market place how many centers of specialized knowledge, documentation or library services can I identify for being relevant, suitable and appropriate for meeting the requirement of my clients to a degree that I do not need to fill out gaps or duplicate with services requested?

Where else in this country – or abroad – do I find centers relevant and appropriate by structure of service to meet requirements of just my clientele?

Such market-oriented – user-oriented – technological information service – fit in with other information marketing services forming together a networking arrangement aimed at mobilizing for the benefit of the ultimate users the national capabilities grown – to foster the socio-economic evolution.

An information marketing service should operate a programme structure including:

a/ Visiting uninvitedly enterprises identified in the area and, by interviewing, assist in identification and formulation of needs for information, i.e. knowledge. (fig. 6).

b/ By knowledge gained during visits (and other investigations), searching and evaluating on behalf of the enterprises information – repackaging the information to match the need and understanding of the enterprises.

c/ Follow-up by advisory and training service until information provided has resulted in improvements and innovation demanded.

d/ Question and Answer service, information analysis service, referral and liaison services aimed at linking up the enterprises with the infrastructure of national capabilities. (fig. 7).

e/ Arranging for an active selective information service tailored (due to the intimate knowledge of the need structure gained from the visiting programme) to continuous stimulation of alertness and procurement of information relevant to the interests of the enterprises. (fig. 8).

Why is such a programme structure not only recommended – but a pure necessity if we want to and as engineers are obliged to foster the economic and social evolution?

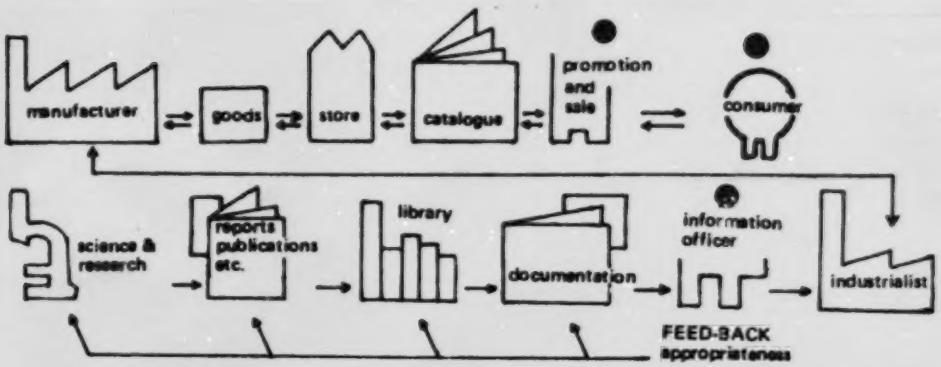
Are not engineers just by education and training equipped to transfer technological information from sources of origination to situations of implementation? Yes – they should be, but practicing their profession, experience proves – that the more a professional cultivates his ability to solve problems, to supervise processes, methods and operations, the more remote he becomes from steadily growing resources of knowledge, the less time-capacity is left for him to take advantage of all the resources of knowledge made more effectively accessible to him by sophisticated systems and services.

Engineers as well as other staff members in private and public enterprises are challenged to solve the problems of their employing organization – they cannot invest too much of their limited capacity on information and documentation science, on the techniques and methods of getting access by terminals to computerized banks of bibliographical and factual data – they badly need to be served with evaluated and repackaged knowledge, which is essential for the survival and growth of their enterprises – these organizational units having the purpose of offering more products and services of higher value and more and better paid jobs.

It is my understanding that the information marketing service (information service for industry, service for transfer of technological information etc.) has to be recognised as an appropriate, important and necessary activity to ensure that gained knowledge and experience are put across and implemented for progress. (fig. 9).

An information marketing service operates as the eyes and the ears of the users, (fig. 10), – it even jumps on its head for its users. (fig. 11).

KNOWLEDGE is a COMMODITY



1

2

EVALUATION ACC TO INDIVIDUAL OR COMMUNITY, EVALUATION ACC TO ENTITY OBJECTIVES & POLICY

converting information
knowledge into practical
results (products-services)

ORIGINATORS
scientists
researchers
specialists

libraries
documentations'
Sc informations'
data banks

USERS
science & research
education
institutions
public authoritie
(planning)

consultants
Technological
services
(in all fields)
inf. analysis center

END-USERS
primary economic sectors
Agriculture
Forestry Horticulture
Fischery
Mining
Natural Resources
etc.

Secondary economic sectors
Handicraft
Industry
Construction
Transportation
Commerce
Communication
etc.

tertiary economic sectors
Administration
Public Services
Institutional Services
Private services
Liberal professions
etc.

SC&T – I&D
infrastructure
application of telecom. & data techn.

Inf. for Industry
infrastructure
intrfacing via man.

4

RESOURCE-ELEMENTS

PHYSICAL	INTELLECTUAL
fixed assest equipment capital	human beings knowledge talent

MUST BE: acquired
useful employed
maintained
developed

3

1
FIELD LIAISON SERVICE

a) Visiting firms uninvited
b) Stimulating demand for knowledge by interviewing
c) Promoting sources of specialized knowledge available

FEED-BACK
The profile of fields of interests and receptivity
Appropriateness of sources and services vailable

6

INFORMATION-SERVICE

1: Examination of the structure of the prospective market
2: The diversification of demand
3: Development and stimulation of demand
4: Active presentation of assortments of "commodities"
5: Training in searching for an utilization of "commodities" available
6: Liaison-service between "consumers" and "stores" and "manufacturers"
Reporting on appropriateness of accessibility of commodities

5

MARKETING OF KNOWLEDGE

4

QUESTION & ANSWER SERVICE

a) Transmitting requests for knowledge documentation, advisory-service etc. to appropriate source of information – establishing personal contact
b) Confidebtial intelligence service upon request (charged for)
c) International referral service

7

2

ACTIVE INFORMATION SERVICE

a) Searching information and evaluation according to "profile" of individual firms
b) Dissemmination selectively uninvited

FEED-BACK
Request for information, documentation and service

8

No one should be interested in the design of bridges
they should be concerned with
HOW TO GET TO THE OTHER SIDE
Cedric Price

9

10

11

INFORMATION FOR DECISION-MAKING BY ENGINEERS

V. Krasnov, USSR

The current scientific and technological revolution is a typical feature of our time. Social and economic development of human society is largely determined by effictive use of its achievements. This is why one of the main tasks of our economic policy is the organic combination of scientific and technological achievements with advantages of the socialist system of economic management.

The successful solution of this task depends to a great extent on a timely supply and use of information on latest developments in science, technology and production. Nowadays it became obvious that scientific and technical information is an important condition of accelerated development of science and technology.

Almost 60 years ago, at the dawn of Soviet power, V. I. Lenin showed clearly the importance of information for the national economy. He wrote: "It is just now that we must see to it that the mass of unusually valuable material available in the form of the experience of the new organisation of production in individual tows, in individual enterprises, in individual village communities becomes the possession of the masses ("Selected Works", Vol. 27, p. 205)".

The growing importance of scientific and technical information for national economic development manifested itself in establishing a State Scientific and Technical Information System of the USSR. At present it consists of 10 All-Union, 86 central sectoral, and 15 republican information institutes, 90 intersectoral regional centres, and more than 10,000 local departments and offices of scientific and technical information at industrial enterprises and organisations. The total number of full-time personnel employed at all these organisations exceeds 150,000.

Transition to the sectoral principle of national economic management predetermined the paramount significance of central sectoral information organs responsible for information supply of their users, including a millions-strong army of engineers working at various plants and factories.

Modern production today consists of several independent technical trends and services. Under real conditions of information supply for engineers, the users may be divided into two main categories:

– highly-qualified engineers vested with a right to make decisions pertaining to the whole organisation where they are employed. This category of engineers embraces heads of engineering services at plants, industrial associations, firms, etc. (the engineering services may include services of the chief engineer, chief designer, chief maintenance engineer, chief technologist, chief power engineer, etc.);

– engineers and technicians of the above-mentioned services.

This division of engineers into two categories necessitated the adoption of a differentiated approach to information provision.

Specialists of the first category need more generalised and condensed information, sometimes with several versions of a decision in question, taking into account the fact that this category of engineers is responsible for making decisions about complex problems. This type of users requires information of a wider subject coverage, which, at the same time, must be clear-cut and precise in form since this category of engineers is generally very pressed for time.

Engineers of the second category solve concrete tasks and deal with narrower problem areas; they need strictly pinpointed information with the complete indepth coverage of the

matter in question. For this type of users the most readily accessible language is the language of drawings and schemes. They require, above all, technical documentation in the form of work drawings, production charts, catalogues of new equipment, specifications, etc.

To solve problems of information provision at enterprises and organisations, information departments have been established as main suppliers of information for the above-mentioned categories of users. The principal aim of these departments is to ascertain specific information requirements of specialists at the given enterprise or organisation and to make information materials obtained from All-Union, central sectoral, and regional agencies of scientific and technical information available for users at their working places.

To provide users with a continuous flow of information there exist two forms of information supply – current and special.

Current information service includes selective dissemination of information on current acquisitions, meeting single requests of specialists, organisation of Days of Specialists, open surveys of literature, etc. Current information service is offered for specialists of both categories, whereas special information service is typical of the first category only. Since the above forms of current information service are well known, I would like to dwell on special information service. It includes the preparation of annual reports for specialists of the first category and the provision of drawing and design documentation (DDD) for specialists of the second category.

Our experience in providing information support for managers has shown that they need special information materials on most important scientific and technological achievements, both Soviet and foreign, which should be taken into account in drafting and discussing plans of national economic development as well as in drawing up plans of different enterprises and organisations.

Importance of this type of work makes it necessary to consider its organisational principles and execution procedures at greater length.

All-Union central sectoral, republican, and regional agencies of scientific and technical information (STI), as well as local STI departments and offices process and generalise incoming information to compile special information materials which should be taken into consideration in drafting and discussing respective plans and in decision making. The materials are prepared drawing on information about most important Soviet and foreign achievements in science and technology, selected from materials meant for distribution within the framework of the current information supply. In preparing such materials results of technical and economic research projects carried out in the corresponding sectors of the national economy are also taken into account.

Information selected for a specified period of time, generally one year, on the most important scientific and technological achievements which should be considered in drafting and discussing plans and in decision making is provided for users in the form of information reports.

Achievements deserving reporting include those which surpass the existing level of production, are conspicuous for novelty and originality of design version and for high technical and economic parameters, and are most effective in solving top-priority tasks set before managers of enterprises and organisations.

The information report is a document containing preliminary selected, studied and evaluated data on the most important breakthroughs in science and technology, both in the USSR and abroad, which are recommended for managers in making decisions about inclusion in plans of appropriate measures aimed at practical use of such achievements. Information reports may also be used in considering draft plans to evaluate the level of planned measures designed to develop and improve the existing technological and production standards with

regard to the current or newly appearing trends of their development. Such reports serve in a certain sense as an "opponent document" to draft plans.

In preparing an information report data are selected with respect to needs of planning organs in information necessary for drafting proposals on solutions of top-priority tasks in improving performance parameters of enterprises and organisations.

To this end, STI agencies (offices and departments) responsible for the report preparation, coordinate its scope and the nature of the information it is expected to contain with the managers of the enterprises and organisations for which the report is meant.

Information on most important achievements, as they are expounded in the report, should be sufficient for the evaluation major advantages of the achievements it describes in terms of their technical and economic indicators.

The preparation of information reports at STI agencies is a purposeful and continuous effort embracing the reference year as a whole.

It consists of the following stages:

– ascertaining, jointly with the client, top-priority tasks in developing the enterprise or organisation, and determining factors hindering or holding back their solution;

– systematic study, analysis and evaluation of incoming information materials and the identification and selection, on this basis, of information on the most important achievements suitable for effective and rapid solution of top-priority tasks;

– technical and economic investigations to substantiate major advantages of achievements selected as compared with the existing level of technology or production activity and also to supplement previously selected data with new findings to assure the maximum possible exhaustivity and reliability of information necessary for making a decision about feasibility of achievements selected;

– writing a report on the basis of the selected data together with the necessary back-up information.

STI services at research and production associations and R&D organisations include the preparation of annual information reports in subject plans of the corresponding organisations; similar reports prepared by STI departments and offices are included in plans of organisational and technical activities.

Work on the report is organized in compliance with a technical assignment approved by the customer.

The technical assignment sets priorities for the solution of the tasks for which information on the most important achievements is being gathered.

If the reference information collection of a STI service contains no adequate information of its own, the necessary data are requested from outside services.

The final selection of information for the report is carried out on the basis of materials contained in subject files and of results of technical and economic investigations.

A typical information report consists of several sections, each containing formal descriptions of respective scientific, technological and production achievements. Standardised descriptions in reference to specific technological and production accomplishments bear, as a rule, the following information:

– name of achievement;

– purpose and field of application;

– designer (name of the organisation and its administrative subordination, name of the firm and its country, etc.);

– authors of project;

– duration of project's design and implementation;

– protection by patent;

– technical description (principle of action; description of construction; specification;

description and parameters of the process; composition and properties of the material; design, technological and operational features, etc.);

– main technical and economic indices (quality, labour productivity, output data, productive capacity, purchase-size of capital investments and term of their recoupment, economic gains from adoption of a novelty in industry, etc.);

– engineering documentation (its availability, organisation keeping its traced copies);

– possible recommendations on use; and

– information sources.

The completed information report is presented to the head of an enterprise or organisation for study and use in drafting work plans and in assessing the scientific and technological level of activities included in the draft plan.

Materials included in the information report are considered and used in compliance with the procedures established by heads of enterprises and organisations, taking into account specific features of their work.

To built reference information collections covering the most important Soviet and foreign achievements, STI services, concurrently with the presentation of the information report to the customer, send one copy to the central sectoral information agency.

Work according to the above-discussed procedures of preparing and presenting information reports proved to be extremely effective.

Managerial personnel uses, as a rule, materials contained in information reports at various stages of decision making, in long-term planning, in preparing instructions, references, speeches, etc.

Now I would like to discuss such type of information for specialists of the second category as drawing and design documentation that is very important for decision making by engineers of the second category.

At present, a unified system of providing enterprises and organisation of the Russian Federation with drawing and design documentation for unstandardised equipment and also with engineering documentations for advanced production operations has been worked out, with regard to the existing experience. The system is based on the following quidelines;

(1) information materials for a DDD collection are selected by a Scientific and Technical Information Centre (STIC) on the territorial principle, i.e. using only data bases of those enterprises and designing organisations which are situated in the region being served by the STIC;

(2) DDD is distributed by a STIC and the State Institute of Scientific and Technical Information on demands from enterprises and organisations irrespective of their departmental affiliation and geographical location; and

(3) requests for DDD can be met by any intersectoral regional information centre independently or in cooperation with other information centre.

DDD collections are built and updated due to active efforts of engineers aimed at searching design versions of non-standard equipment and advanced technologies implemented with a high economic effect at enterprises in the region which is served by particular information centre.

Designs of non-standard equipment are checked for novelty which is considered true only when equipment of a given design has never been used at other enterprises and when information on such equipment has never been published by Soviet information agencies. To this end, the existing reference tools and so-called integrated card file of organisations keeping traced engineering documentations. Apart from the check, designs of non-standard equipment are compared with commercial versions and standardised equipment described in trade catalogues, printed standard specifications in mechanical engineering, card files, etc. A promising non-standard equipment or technological processes may vary in significance and as a

result the corresponding drawing, design and engineering documentation may be requested and used either by customers in the given region only or by outside customers.

Accordingly, the total DDD collection has been divided by its significance into national and local.

Materials meant for the national collection must meet stricker requirements and include designs and technological processes presenting interest for several sectors of the national economy. Such materials embrace works of research institutes and design offices in case they are protected by inventor's certificates, received diplomas or medals at exhibitions, and completed and adopted in industry; and original designs and technological processes worked out at industrial enterprises.

The above requirements must be backed up by economic effect from the adoption of designs or technological processes in industry, which must be not less than 1000 rubles a year.

Materials failing to meet these requirements are meant for a limited distribution from DDD collections of local significance.

Technical documentation intended for information centres must contain complete sets of project description. Specifically, the following information should be given in describing a design or technological process:

purpose and field of application; description of a design or technological process, and its operating principle or performance parameters;

special requirements for the manufacture and adjustment of a design or technological process;

specifications;

economic effect from adoption in industry.

The technical description must contain information on specific characteristics and advantages of a design or technological process as compared with well-known design or engineering versions.

Enterprises and organisations sign an agreement with a STI centre in compliance with which they establish time terms (2 or 3 years, depending on importance of innovation and its novelty) for the distribution of drawing and design documentation and bind themselves to provide the given information centre with the necessary information on all improvements in the innovation design (replacements of separate drawings, changes in parameters of individual processes, etc.).

To notify engineers working at different industrial enterprises and organisation all over the USSR about the engineering documentation available at STI centres, the State Institute of Scientific and Technical Information publishes and disseminates a List of Organisations Keeping Traced Drawings.

STI centres report to one another about available DDD of local interest with the help of a printed Card File of "Local Experience". Where by engineers of the second category are kept informed about documentation of both national and local importance and can use it efficiently in their work.

The further improvement of the information support for engineers on the basis of all-round mechanisation and automation will make it possible to raise the standard of information services for engineers.

STANDARDS INFORMATION FOR ENGINEERS

L. Eicher – USA

I. Introduction

Providing engineers with the information they need to effectively carry out their various functions is a complex task. There is, however, one specific kind of engineering information that is widely recognized, especially by engineers, as an essential information tool. I refer to engineering and product standards or norms. There are, of course, a great many similiarities between standards information services and other technical information services for engineers, but there are also some important differences that are due to the specialized nature of standards themselves. Later in this paper, I intend to discuss some of those differences in some detail, but before I do, I would like to use a short story of our experiences in the United States to illustrate the need for good standards in an industrial economy and the parallel need for good standard information services.

At the beginning of this century, standards were not widely accepted as necessary pieces of technological information. There is an historical illustration of our failure to adequately use standards in the United States which I would like to share with you. In 1904, a great fire broke out in downtown Baltimore, a city on our Atlantic Coast, close to Washington, D. C. The fire became so serious that help was solicited from Washington and eight other cities, including New York. The additional fire brigades arrived in Baltimore within 3 hours, but their fire extinguishing equipment was useless – the screw threads on their fire hoses did not fit the Baltimore hydrants. The firemen stood by helplessly as 70 city blocks and more than 1500 buildings were destroyed in the conflagration.

In part, due to such tragic incidents and in part due to technological progress and cooperation, the need for standards and standards information services is now well recognized at both the national and international levels. This recognition has resulted in national standards information activities by several major national standards organizations, such as the Association Francaise de Normalisation (AFNOR); the Deutshen Normenausschuß (DNA); the Britisch Standards Institute (BSI); Gostandart in the USSR; and the National Bureau of Standards' Standards Information Services in the USA. On the international level, the International Organization for Standardization's Standards Information Network (ISONET) is now in advanced planning stages. We foresee that through ISONET, engineers world-wide will have increased access to national and international standards information.

II. Standards as Specialized Information Documents

Standards are information documents of a highly specialized nature, which present technological and economic information in a consolidated form. They are used primarily in national and international commerce by producers, buyers and sellers as information tools for product testing, design, manufacturing, purchasing, and for terminological definitions. Governments use standards for regulation in such areas as health and safety – and in purchasing. As we well know, governments in any economy are very large purchasers.

In additional to technological information which is very tangible in a standard itself, a standard contains a degree of convention or acceptance of a process, material or product. This degree of acceptance or recognition, present only by implication in the document itself, becomes apparent in the marketplace when the produce or service succeeds. A process, material, product or service may be accepted and salable because somewhere in its

development, the developer has complied with right standards. Thus, standards are an introduction into the marketplace and can smooth the purchasing process.

The marketplace is the key point for testing a product or service and the technical information which contributed to its development and will contribute to its degree of use and success. When the seller is able to show a prospective buyer that his product conforms to accepted standards the buyer feels more assured that he is purchasing high quality and performance as well as the product. Good standards, then, are mechanisms through which technology is transfered between buyers and sellers and introduced into the economy.

III. Problems in Engineering which are often solved by using Standards

In each phase of product engineering-design, production, operation, maintenance – or in management of these phases, standards can be used to help increase quality and efficiency and to assure safety. I would like to use a power plant example to illustrate the types of standards which can be used in each of the phases. In the design phase, the U.S.architect and engineer comply with certain state and Federal building codes; they also consult the safety requirements for design and construction of power plants – whether nuclear, hydroelectric or electric power. The construction engineers and contractors would follow recommended safety procedures in the production phase and assure that the design safety requirements were being met. Once the power plant is built and in operation, the operators themselves adhere strictly to the appropriate power safety requirements and regulations.Throughout the operation, there is of course, scheduled maintenance and inspection – all done with the help of standards and recommended practices. Management, guided by standards and experience, is continuous in each of the design, production, operation and maintenance phases.

IV. Information Technologies Used in Standards Information Services

At present, the process of educating users of technological information takes place mainly in standards information centers and in actual engineering practice via experience in documentation and information searching. The information user has several search technologies available to him currently. Technical information centers use standards information in hard copy or microform, or access computer banks through peripheral terminals. The Centers may also publish search tools, such as specialized indexes. Perhaps the most widely used means of information transfer is person-to-person communication. We all realize that there is nothing new in any of these four means of transmitting information – the challenge is to make the most efficient use of the technologies to assist in the communication of information about standards. The first step is education and training of users. What's available, where, and from whom? When and how can we get the information? Is there a cost?

V. Some Successes in Standards Information Services

There are some major successes in standards information services: the Association Francaise de Normalisation in France, the British Standards Institute in the United Kingdom, the Deutschen Normenausschuß in West Germany; and GOSTANDART in the USSR. I am aware that many other countrieshavedeveloped highly efficient standards information services, but since the Standards Information Services at the National Bureau of Standards are the most familiar to me, perhaps it would be best to take them as an example of how the four information technologies I mentioned earlier work.

Hard copy: The NBS/SIS reference collection now totals over 240 000 U.S., foreign, national and international standards in hard copy.

Microform: NBS/SIS uses a commercial microfilms servece called Visual Search Microfilm File. The microfilm files contain standards from nine major U.S. standards and testing organizations, the International Organizations for Standardization, and the International

Electrotechnical Commission. There are also files containing military specifications, product vendor catalogs, building and construction regulations, and the regulations and standards of the U.S.Nuclear Regulatory Commission.

Computer terminal: NBS/SIS owns and operates a computer terminal through which searchers can access the NBS UNIVAC 1108-A computer. NBS/SIS also has access through the main NBS Library to the scientific and technical data bases maintained by the Lockheed Corporation and the Systems Development Corporation.

SIS also publishes search tools: indexes of U.S. voluntary engineering standards; international standards (from the 150 and the IEC); plastics standards; U.S. State Specifications and Standards; and U.S. standardization activities.

Services: Using the technologies I have just described, NBS/SIS provides a number of services. The purpose of NBS/SIS is to serve both as an information center and a reference and referral activity by identifying sources of standards and directing inquirers to the respective standards-issuing organizations to obtain copies of the standards. Using special Key-Word-In-Contex (KWIC) Indexes, SIS answers over 8 000 inquiries on standards per year by telephone or in person, and the number increases each year. NBS/SIS answers such questions as: What are the standards in the fluid power industry? Are there any standards for electric toasters? Have test methods been established for various characteristics of fireclay brick? Have specifications been developed for magnetic ink?

Standards can help conserve energy and materials, help protect health and safety and promote efficient and equitable market transactions. Standards also serve to preserve technical knowledge, experience, and know-how developed in the past. These benefits can only be fully realized if the information systems that support the development and use of standards operate effectively.

I do not want to imply that we have solved all our problems in the standards information area, but I do hope I have given you an idea of how we approach them. I would be happy to answer any questions.

INPADOC AND ITS SERVICES

O. Auracher, AUSTRIA

First I would like to thank the organizers of this symposium for inviting me to present INPADOC to this forum. INPADOC was founded on the basis of an Agreement concluded on May 2, 1972, between the Republic of Austria and the World Intellectual Property Organization in Geneva, a specialized agency of the United Nations.

A long time before that date there were already efforts within the World Intellectual Property Organization to establish a worldwide patent documentation center. These endeavors date back to 1965 and 1966. As the task was difficult, an institution had to be found which could count on being supported by a country, because this guarantees that the profit motive is not the only decisive factor in the activities of such an institution. Thus patent offices and international organizations as well as private users are given a guarantee that important information will always be available.

The founding of INPADOC by the Republic of Austria must also be seen in the light of the foreign policy of a small country located at an East-West intersection that seeks to make its policy of neutrality credible, among other things, by giving many international organizations the opportunity of becoming active in Austria.

INPADOC was given the task to provide information services in the field of patent literature. In a number of respects patent literature is a special case because it constitutes primary literature. Through it technical developments are made available to the public for the first time. In most cases the same invention is published in scientific journals only some years later. Thus patent literature is a valuable instrument in helping to prevent duplication and re-inventions.

Secondly, patent literature is a special case due to the details given. In a patent specification an invention must be described with such precision as to enable an expert to reconstruct the development.

In addition to these characteristics of patent literature, there is the great number of patents published throughout the world, some 800.000 a year.

The patent offices must provide precise documentation of patent literature. This calls for devising documentation systems which class this vast amount of documents according to various aspects and offer selective access to the patents of an individual applicant or inventor and to the patents published in a certain field of technology. Due to the cooperation of patent offices and the international development (Patent Cooperation Treaty, European Patent Convention) the patent offices are faced with the necessity of providing uniform search material. The answer to the question of whether or not an invention is new is based on this search material. The patent offices increasingly use this search material in passing information on to the industries of their countries. Beside this, the exchangeability of information on patent literature is to be facilitated.

In order to reach this aim, the World Intellectual Property Organization and the Republic of Austria have concluded the Agreement mentioned above. The conclusion of the Agreement was soon followed by the establishment of the technical prerequisites necessary for providing information services that help to solve the problems referred to before. The following services were set up:

the Patent Family Service (PFS)
the Patent Classification Service (PCS)
the Patent Apllicant Service (PAS)

the Patent Inventor Service (PIS) at the beginning of this year.

Owing to the lack of effective international laws it has so far been necessary to file an invention separately in each individual country. This results in an invention being published in various countries and languages. All the publications concerning the same invention are referred to as a patent family. The Patent Family Service makes it possible to bring together all patent family members belonging to the same invention.

The Patent Classification Service groups the patent literature in 51.436 subdivisions. The Applicant Service provides access to all publications of the same applicant. The Inventor Service makes it possible to retrieve all documents stored under the same inventor name. All these information services have been created solely by means of electronic data processing.

The technical system to be created had to meet the following requirements:

1. In providing the information services use is made of the original data carriers that are used by the individual patent offices mainly for producing the Patent Gazettes or the patent specifications.

2. It must be possible even for specialists with less training to use the information services without further technical equipment.

3. The information services are to provide low-cost copies as far as possible.

4. Developing countries must be capable of using the information services without great technical or organizational difficulties.

Therefore INPADOC proceeds as follows: The data sent to Vienna by the patent offices are reformatted, processed by test programs and arranged in a standardized data format. (annex 1 Data flow from the Patent Offices). From this a weekly update data tape is produced and sent to the patent offices as a tape service. It also serves as the basis of the express information services of the IPG for industry. These weekly tapes are cumulated and added to the INPADOC data base at regular intervals. From this data base lists of all data records according to various search criteria (patent family, classification, applicant, inventor, etc.) are produced by re-sorting. In this way quick access to the data elements required becomes possible.

The data files are delivered on COM microfiches. On one 105 x 148 mm microfiche there is enough space for 207 pages of information. Each edition of an INPADOC service comprises an average of about 60.000 pages. This is a pile of microfiches about 5 cm high, while the paper printouts would reach a height of about 6 m.

Processing the complete text of patent documents would be possible technically, but virtually impossible as far as cost is concerned. This is why the documentation center was instructed to limit these services to the following bibliographic data (annex 2 List of bibliographic data).

At present INPADOC disposes of two data bases, the one covering the data of patent documents published before 1977 01 01 (annex 3 INPADOC Backfile) and the other covering the data of patent documents published after 1977 01 01 (annex 4 INPADOC data base 1977 06 24). The two data bases comprise over 5 million data records and include all major inventions published in the past nine years.

To gain possession of these data, INPADOC concluded cooperation agreements with many patent offices which provide for the delivery of these data in machine-readable form (annex 5 List of cooperation agreements).

This guarantees the users of INPADOC services that the data are precise and that delivery to INPADOC is quick. Errors encountered are reported back to the offices, which ensures a data coverage free of errors. We are pleased to note that the patent offices are making use of our services to an increasing extent. The following patent offices are subscribers to INPADOC services (annex 6 Patent offices as subscribers to INPADOC services

The services available can be divided into the following categories (annex 7 Categories of

INPADOC services):

- Individual Requests
- Subscription Services
- Copy Services and Special Services

Typical questions for Individual Requests are:

What is the corresponding patent in Germany to a given author's certificate in the United States?

What patents of Siemens have been published in the field of semiconductors in the past four years?

What patents have been published in the last nine years in the field of paper making?

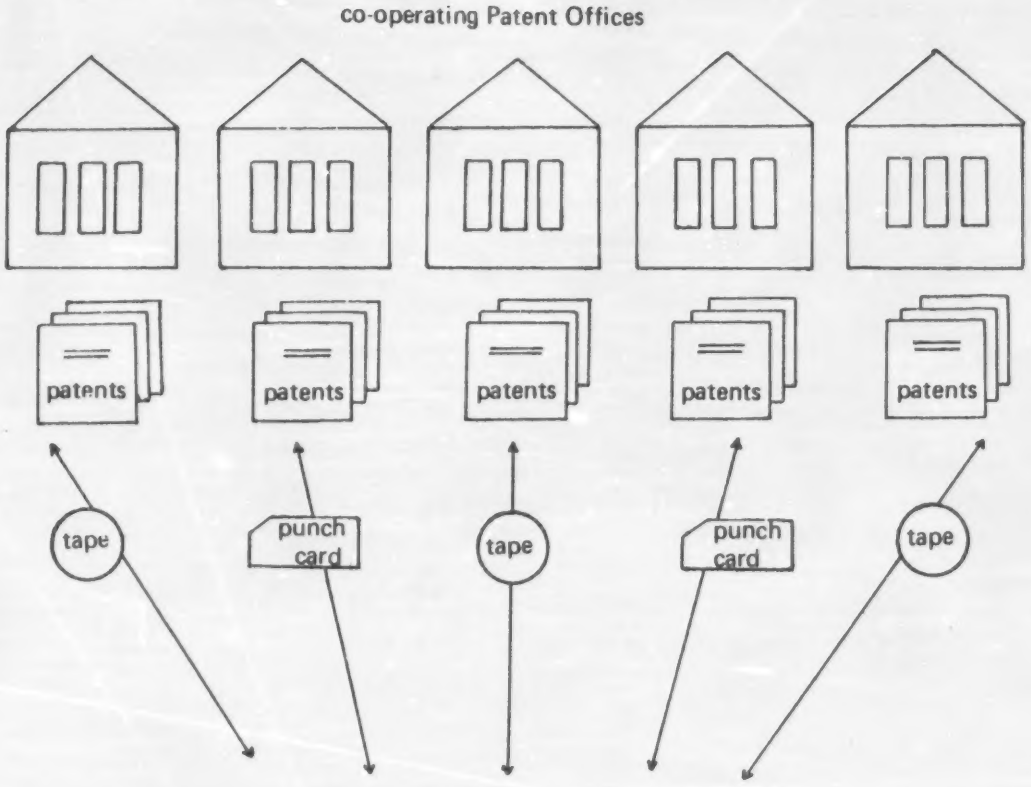
The answers to these Individual Requests, normally will be given within two working days. For patent watching INPADOC has created the INPADOC Patent Gazette (IPG) which is similar to the already existing patent gazettes, however with two decisive advantages (annex 8 Example IPG):

1. The IPG covers not just one but up to 43 countries.
2. With every new patent document, already existing corresponding documents of the patent family are added.

Beside the above mentioned services based solely upon the bibliographic data of patent documents INPADOC provides an extensive Copy Service for patent documents. Copies can be obtained either on paper or on 16 mm roll film. INPADOC can be addressed by individuals or organizations via letter, telex or telephone.

While Austria is technologically a highly developed state, it has only 7 million inhabitants. The task it has taken on in collaboration with the World Intellectual Property Organization is evidence of the fact that smaller states can promote the cause of international co-operation and aid development.

ANNEX 1



PATENT FAMILY SERVICE

priority

PATENT CLASSIFICATION SERVICE

classific.

PATENT APPLICANT SERVICE

appl. name

PATENT INVENTOR SERVICE

inv. name

ANNEX 2

SPECIFICATION OF BIBLIOGRAPHIC DATA

STORED IN INPADOC'S DATA BASE

For each published patent specification (applications laid open for public inspection, published applications, patents, inventors' certificates, utility models (for DT only) the following 10 bibliographic data are stored in INPADOC's data base:

DATUM	INPADOC ABBREVIATION	DESCRIPTION
1	CC	Country of Publication
2	KD	Kind of Document
3	DOC.NO.	Number of Document
4	APPLIC.NO.	Number of Application
5	APPDAT	Date of Application
6	PUBDAT	Date of Publication (or if such date is not available, a clear reference e.g. issue number and year of the Official (Patent Gazette)
7	IPC	International Patent Classification Symbols
8	CC	Country of Priority
9	PRIORITY NO	Number of Application on which priority is based
10	PR DAT	Date of Priority
The data		
11	APPLICANT	Name of Applicant, or owner of patent or successor in title (as stated in the patent document at the time of publication)
12	INVENTOR	Name of Inventor
13	TITLE	Title of the Invention (in original language)

are not yet covered for all countries.

According to international recommendations, INPADOC gives the date in this order: year, month, day.

ANNEX 3

INPADOC DATE BASE BACKFILE

March 1977

COUNTRIES		FROM PUBLICATION DATE	FROM DOCUMENT NUMBER	
BE BELGIEN		640515	643001	
CA CANADA		700804	848159	+
CH SCHWEIZ		690331	470127	
DK DÄNEMARK		680429	111000	
DT BUNDESREP. DEUTSCHL.	OS,AS,PS	670105	1201322	+++
DT BUNDESREP. DEUTSCHL.	GM	681017	6600001	+++
ES SPANIEN		680101	234239	
FR FRANKREICH	PAT	681129	1548001	
FR FRANKREICH	MED	680520	6051	
FR FRANKREICH	ADD	681220	92701	
GB GROSSBRITANNIEN		690430	1150001	
IL ISRAEL		680125	18116	+++
LU LUXEMBURG		450602	27693	
NL NIEDERLAND		640310	6400001	
NO NORWEGEN		680701	115000	
OE ÖSTERREICH		691210	276701	
SF FINNLAND		680531	40001	
SW SCHWEDEN	++	680401	300001	
US USA	PAT	680102	3360800	
US USA	REISSUE	680102	26328	
ZA SÜDAFRIKA		710127	604596	+++
ZB ZAMBIA		720121	271	+++

\+ Only documents claiming CA-Priority
++ Not yet complete
+++ These documents are not published as closed series of document numbers.

ANNEX 4

INPADOC Datenbestand per 1977 06 24
INPADOC Data-Base 1977 06 24
ENSEMBLE DES DONNEES DE L'INPADOC 1977 06 24

LÄNDER /COUNTRIES/PAYS CC	CC*		PUBLICATIONSDATEN PUBLICATION DATES DATES DE PUBLICATION	PUBL.–FREQUENZ FREQUENCY OF PUBL. FREQUENCE DE PUBL.
AR		ARGENTINIEN	73 02 08 – 75 10 31	M
AU		AUSTRALIEN	73 01 18 – 77 05 19	M
BE		BELGIEN	73 01 02 – 77 04 14	T
BG		BULGARIEN	73 11 10 – 77 05 20	3 M
BR		BRASILIEN	74 07 18 – 77 06 07	W
+CA		KANADA	74 01 01 – 77 06 07	2
CH		SCHWEIZ	73 01 15 – 77 04 15	2 W
CS		TSCHECHOSLOWAKEI	73 08 23 – 77 05 31	M
CU		KUBA	74 02 13 – 77 03 08	B.B.
CY		ZYPERN	75 03 01 – 76 12 17	3 M
DK		DANEMARK	73 01 02 – 77 06 06	T/W
DL	DD	DDR	73 07 12 – 77 06 08	3/M
DT	DE	BRD	73 01 04 – 77 06 23	W
EI	IE	IRLAND	73 01 10 – 77 02 16	2W
ET	EG	AGYPTEN	76 01 31 – 77 04 30	M
FR		FRANKREICH	73 01 05 – 77 06 03	W
GB		GROSSBRITANNIEN	73 01 04 – 77 06 01	W
HK		HONG KONG	76 03 05 – 77 05 06	W
HU		UNGARN	73 07 28 – 77 05 28	M
IL		ISRAEL	73 01 30 – 76 02 29	M
IN		INDIEN	75 08 02 – 76 11 27	W
IT		ITALIEN	74 09 20 – 77 04 30	M
JA	JP	JAPAN	73 04 02 – 77 05 31	T
KE		KENIA	75 07 11 – 76 09 17	2
LU		LUXEMBURG	73 01 05 – 77 05 20	3-4/W
MC		MONAKO	75 10 10 – 77 02 04	3 M
MO	MN	MONGOLEI	72 11 20 – 76 03 12	B.B.
MW		MALAWI	74 07 10 – 75 09 10	M
NL		NIEDERLANDE	73 01 02 – 77 05 31	T
NO		NORWEGEN	73 01 02 – 77 06 13	T/W
++OR	AT	OESTERREICH	73 01 10 – 77 06 15	M
PH		PHILIPPINEN	75 07 03 – 77 04 28	W
PO	PL	POLEN	73 08 31 – 77 04 30	CA.2M
PT		PORTUGAL	76 01 01 – 77 05 01	M
RU	RO	RUMANIEN	73 07 20 – 77 05 15	M
SF	FL	FINNLAND	73 01 31 – 77 05 31	T/M
SU		UDSSR	73 01 08 – 77 06 05	W
SW	SE	SCHWEDEN	73 01 08 – 77 06 20	T/W
US		VER. STAATEN V. AMERIKA	73 01 02 – 77 06 07	W
YU		YUGOSLAWIEN	73 02 28 – 77 04 30	2 M
ZA		SÜDAFRIKA	73 01 31 – 76 04 28	M
ZB	ZM	ZAMBIA	73 01 22 – 76 12 21	M
43		TOTAL	77	

CC* Anderungen ab verarbeittungstag 780101 /changes from 780101 onwards/ chargements a partir de 780101

\+ Mit Erlaubnis von Information Canada reproduziert

++ Patentplatt

T Täglich/daily/ quotidiennement

W Wöchentl. /Weekly/ Hebdomadairement

2 W Viernehntätig/fortnightly/Bi-Hebdom.

M Monatl./Monthly/Mensuellement

2 M Zweimonatl./6 per year/Bi-mens

3 M vierteljährl. /quaterly/ trimestr.

Ca 2 m ca 6x P.A.

B.B. Unregelm./not regularly/Irregul.

3/M 3x Monatl./3x per month/3x par mois

3–4/w 3–4 je Woche/3–4 per week/ 3–4x par sem.

ANNEX 5

COOPERATION AGREEMENTS
between
INPADOC and the
PATENT OFFICES or ORGANIZATIONS

COOPERATING PARTIES	DATE OF SIGNATURE	COUNTRY COVERAGE
Japanese Patent Office (JAPATIC)	1972 11 17	JA
The State Committee for Inventions and Discoveries of the Council of Ministers of the USSR	1972 11 30	CS, CU, BG, DL, HU, NO, PO, RU, SU.
Institut National de la Propriété Industrielle (INPI Paris)	1973 05 22	FR
Deutsches Patentamt	1973 05 22	DT
Patent Office of the Commonwealth of Australia	1973 05 29	AU
Institut International des Brevets (IIB)	1973 09 12	BE, CH, GB, LU, NL.
Danish Patent Office Finnish Patent Office Norwegian Patent Office Swedish Patent Office	1974 08 28	DK, NO, SF, SW.
U.S. Patent Office	1974 10 09	US
The Bureau of Intellectual Property (Canada)	1975 04 15	CA
Registro de la Propiedad Industrial (Spain)	1976 03 04	ES
Research Association of Slovenia	1976 12 29	YU

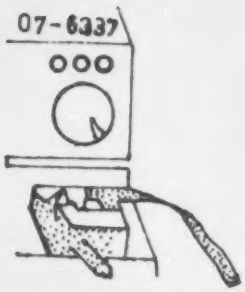
ANNEX 6

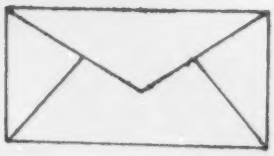
GOVERNMENTAL USERS OF INPADOC – SERVICES

The INPADOC-services are today subscribed by governmental users of the following countries (new subscriptions in 1977):

Data Tapes ASD	Australia, Federal Republic of Germany, IIB, Japan (JAPATIC), Soviet Union.
FDT	Soviet Union, Yugoslavia (Research Association of Slovenia).
Patent Family Service	Austria, Denmark, Federal Republic of Germany, Finland, Norway, Spain, Sweden (2 sets).
Patent Family Service Backfile	Denmark, Federal Republic of Germany, Finland, Norway, Sweden (2 sets).
Patent Classification Service	Austria, France (Paris and Lyon), Spain.
Patent Classification Service Backfile (FR)	France
Numerical Data Base	Federal Republic of Germany (Berlin, Munich, Nuremberg)
Patent Applicant Service	Great Britain, Spain.
INPADOC Patent Gazette	Australia, Greece (ELKEPA), Japan, Soviet Union, Spain, Yugoslavia (Research Association of Slovenia).
Microfilms	Brazil, Canada, Denmark, France, Japan, Netherlands, Norway, United States.

ANNEX 7





- **INDIVIDUAL REQUESTS**
  paper
  microfiche /com/

- **SUBSCRIPTION**
  microfiche
  magnetic tape

- **COPY SERVICES**
  microfilm/paper

- **SPECIAL SERVICES**

PRODUCED: 77.07.15 PAGE: 5 351

MICROFICHE 28/1977

I P G SELECTED APPLICANT	APPLICANT SERVICE CC PUBDAT	KD DOC. NO	CC PR.DAT	PRIORITY	I P C	EQUIVALENCES (PUB.BL)		TITLE
RHONE POULENC SA	EI 770316 B	36909	FR 711129	7142683	C07G 11/00 C12D 9/14	AR 731109 A1	195810	NEW ANTIBIOTIC
						AU 740530 A1	4934272	
						BE 730528 A1	792012	
						CA 751028 A1	976898	
						CH 731228 A	544147	
						DT 730607 A1	2258537	
						FR 730713 A1	2161784	
						FR 750207 D1	2161784	
						GB 750122 A	1381180	
						JA 730901 A2	48062994	
						NL 730601 A	7216740	
						OE 750515 A	1014672	
						OE 760310 B	328074	
						US 740702 A	3822350	
						US 750701 A	3892849	
						ZA 730725 A	728387	
	DK 770704 B	135843	FR 731127	7342191	C07H 15/24	AU 760527 A1	7573074	FREMGANGSMADE TIL FREMST
						BE 750526 A1	822618	ILLING AF ANTIBIOTIKET
						CH 770415 A	586642	20.798 RP ELLER ET SALT
						DK 750728 A	614774	DERAF MED EN SYRE
						DT 750528 A1	2456139	
						ES 770216 A1	432340	
						ES 770310 A5	432340	
						FR 750620 A1	2252352	
						GB 761222 A	159538	
						JA 750703 A2	50082285	
						NL 750529 A	7415044	
						OE 760715 A	950574	
						OE 770325 B	335597	
						SW 750528 A	714848	
						US 760323 A1	527040	
						US 770322 A	4013515	
						ZA 760128 A	747509	

IT 770510 A	FR 730613	732194	C08G	BE 741212 A1	816237	POLIMERI DI SILALATTONI PARZIAL MENTE RETICOLATI LORO PREPARAZIONE E LORO IMPIEGO
				DT 750109 A1	2428189	
				FR 750131 A1	2235964	
				FR 760430 B1	2235964	
				GB 770427 A	1471699	
				JA 750402 A2	50034091	
				NL 741217 A	7407557	
				US 760406 A	3948864	

(C) 1977 INPADOC MICROFICHE

PRODUCT INFORMATION AND TRADE LITERATURE FOR ENGINEERS

V. Piróg – POLAND

Definitions

The word "product" is understood in this paper as a finished product, ready for use, and also as a material from which the finished product is processed. For example, there are following materials: steel iron, light metals, plastics, timber, glas, leather, wool, cellulose and so on.

Finished products can be classified differently e.g. depending on their end use. According to this criterion the products can be classified in following groups:

– serving an immediate consumption by man or for his fundamental needs, e.g. food, clothing, footwear, house-equipment, cars, bicycles, etc.;

– equipment and tools for professional activity /e.g. equipment for craftsmen, medical equipment etc/;

– equipment and machines for production of other products, equipment and machines for building, for agriculture, for special functions in social life etc./e.g. equipment and machines in factories, means and equipment for transport and communication, technical equipment in the cultural posts etc/ those products, which are of chief interest for engineers from the point of view of improving features and processes of their production are those in the second and third groups.

Product information may concern physico-chemical features, technical data, purpose, manufacturers of products, sources and conditions of supply etc. The aim of product informationis to givea purchaserdata with respect to the usefulness of the product for his needs and to give data to the specialists in that branch of production concerned with the technical level of product and its modern solution.

By the term "trade literature" in this paper is understood publications and other documents concerning products, their manufacturers, sources and purchase conditions, prescriptions for using and maintenance, places and circumstances of receiving information on products. Parallel to the term "trade literature" some countries in information practice use the term "firm literature". In this case firm literature concerns the publications and documents worked out and issued by industrial firms as well as publications on those firms, which are issued by institutions and trade organizations of national, social and other nature with the goal of developing industry, trade exchange and economic co-operation.

Kinds of product information

We can distinguish the followingkinds of information on products:

– individual information on product concerning its physicochemical features, technical data, its purpose and utilisable features /e.g. by technological machines – efficiency, service scope, demand on energy etc./ maintenance and repair, requirements, address of manufacturer, sources and conditions of purchase and so on. We can call this type of information primary information delivered by a manufacturer;

– secondary information processedby information centre according to the needs of users;

– analytical secondary information, processed according to the special rules from individual information on products of different manufacturers which affords possibility to compare the features and quality and other data of those products. In general, we can name product information – factographical information.

Product information delivered by a manufacturer and disseminated among the anonymous users is not always complete. However it can provide real data on product features, it can be limited only to the positive features, and not to reveal the features which are less profitable in comparison with competitive products.

Among various organizations and methods of preparing and disseminating product information in the second half of sixty years activity is a special information centre, INDATA, in London. This centre is based on a computer data bank of technical information on selected groups of electronic products produced in the United Kingdom and imported into this country. The information was obtained from the manufacturers of these products, who at the same time were the fundamental group of information users. This information was disseminated every two weeks. The method and the scope of the most important data were prepared by well known specialists in this field of technology.

The great difficulty in preparing product information is the variety of names of features and technical parameters with respect to objects and measures applied by various manufacturers. These circumstances cause difficulty in evaluation of the technical quality and utility of product for a given purpose, and especially, in comparison of products of various manufacturers. This difficulty is particularly evident in the case of basic materials for production of finished products. Research concerning ways to solve this problem are anticipated in the long-term program of WFO/CEI.

Information sources on products

There are the following information sources:

– trade literature and scientific technical periodicals publishing papers on products and advertisements of industrial firms;

– exhibitions and fairs.

The trade (firm) literature contains publications and documents prepared and issued by those interested in these firms and publications concerning manufacturers and suppliers are prepared and issued by institutions and organizations above mentioned. Most often the publications and documents appear in the following form: catalogues and prospectus of products, pricelists, periodicals, guides, handbooks, publicity publications /placards and leaflets and various occasional issues/. These publications are mostly richly illustrated. The catalogues contain tables with technical and economic data.

A very important item in firm literature are periodicals /issued at different times/ published usually by the large industrial firms e.g. monthly magazine "Siemens-Zeitschrift" issued by Siemens Aktiengesellschaft, Berlin-München. These periodicals are designed for the specialists-customers of products of given firms in order to maintain steady contact with them and to improve also the technical qualifications of their technical personnel. Especially valuable in those periodicals is the information on research, because it characterizes the direction of firm development and also its scientific potential. With a purpose similar to the periodicals, these firms issue handbooks, guides and technical calendare; they contain instructions and schematic diagrams for montage and exploitation of products /e.g. Pöilipe , data Handbook/.

The most popular form of firm literature are catalogues and prospectuses. There are two kinds of these issues:

– trade and publicity catalogues and prospectuses;

– technical catalogues and prospectuses.

The first have the following features: large-scale in character, irregularity, inequality of publishing forms, very often incompletences of data, indication of positive features, limited data in technology and construction. They are very sasy to obtain. Considering their incompleteness, this kind of publication is used with some reservation.

Technical catalogues are the most important information source, because they contain the

exact technical and economic data of products. As a rule, they are designed for a special group of customers or potential customers and for their own personnel.

The pricelists contain mostly a general characterization and the most general data of products as also they give prices and conditions of supply.

The firms often issue occasional publications in which they characterize the potential of firm, field of production and list more important supplies and services worked out for customers.

A special form of catalogues is called catalogues cards of products. An example of this kind are the cards produced by information centres in the field of building in Poland and Sweden. They contain technical data of materials, byproducts, equipment, tools and machines. They are of great value to designers and builders.

The catalogues and prospectuses are an earlier source of information about the new products and new technical solutions applied by firm, than are the scientific technical periodicals issued by professional publishers. This outpacing is estimated at about two years. The characteristic feature of catalogues and prospectuses is short life as an information source – about 1-3 years depending on rapidity of technical progress and development of firm.

The information source for product manufacturer and suppliers are firm registers. They are issued by different organizations. One well known register is Kompass Register issued by Kompass Publishers Ltd., which belongs to the International Organization Kompass World Wide Offices, Foundation for Promoting International Information in Zürich. The branch companies of Kompass exist in many countries. Also Zürich is the information bank of Interconsult Kompass-Computer A.G.

Some countries issue national firm registers. Publications like the firm register are the catalogues of firms and exhibitions which contain the lists of exhibitions and lists of exhibited products/e.g. Leipziger Frühjarmesse-Katalog and Catalogue of International Fair in Poznan/.

Fairs and exhibitions, especially international ones, are very good sources of information on products and manufacturers. They make it possible to identify the products of firms, to receive firm publications and to have personal contacts with representatives of firms. Published guides facilitate visiting the fair. During the exhibition and fair there are organized technical conferences and meetings of manufacturers with the specialists interested in these areas.

The national Exhibition on Achievements of National Economy in Moscow is well known as is the great role in building information that the exhibition organized by Bouwcentrum in Rotterdam in Holland plays. The long tradition of the International Fair in Brno, Hannover, Leipzig and Poznan is also well known.

Information and Trade Literature

Information on Trade Literature is organized by centres on science and technology. They gather sources of this kind of literature, particularly, firm catalogues, and prepare and disseminate information among the companies interested on such literature. Great achievements and experience in this field are represented by the national scientific technical information services in Czechoslovakia, Poland, Hungary and the Soviet Union.

Active in this field in Poland is Firm Information Centre of Centre for Scientific, Technical and Economic Information /CINTE/, the Centre for Technical Progress in Katowice and Office for Technical Information NOT in Poznan. CINTE issues quarterly "Informator on Trade Literature", which contains abstracts of catalogues and prospectuses, production programs, pricelists and other national and international issues. Within the international science and information system of Comecon Countries has been organized a special information subsystem on industrial catalogues. The leading role in this subsystem belongs to the Governmental Scientific Technical Library in Moscow /GPNTE/. This library prepares and issues every two

weeks the Bulletin entitled "New Industrial Catalogues".

Of particular interest is the international exhibition in the field of firm literature organized every year in September in Katowice by: Centre for Technical Progress in Katowice, CINTE and Polish Chamber of Foreign Trade. In this exhibition cb.2000 national and foreign firms /ca. 30 countries/ present about 15000 catalogues of products and other firm literature. During the exhibition technical meetings and conferences are organized and lectures are presented by representatives of exhibitors.

Proposals for improvement

The great role of information on products and trade literature for practical transfer of technical progress requires suitable conditions for its development and improvement. For this purpose it is necessary to: strengthen the exchange of firm publications, improve their form and contents and also to unify nomenclature of data characterizing the most important features of products. The problem of improvement of this kind of information is also the task of WFEO/ CEI.

STATISTICAL, ECONOMIC AND MARKETING DATA INFORMATION FOR ENGINEERS

S. AL-Shaikhly, IRAQ

1. Introduction

When one talks of engineers, a multitude of disciplines come to mind. Therefore, an engineer's need for data and information will largly depend on the discipline he is in and the activity or the role he has in his profession. The term may apply to a senior engineer in a responsible design or managerial post as well as to a junior engineer. It could also apply to those involved in design or implementation, managerial or research and development activities. An engineer can be a policy maker or just a technician. The need for data will vary at each of these levels, positions and occupations.

Furthermore, the engineering profession itself is wide and varied, but traditionaly four categories can be identified; civil, mechanical, electrical and chemical. From these, a number of other specialized subgroups have emerged, to the extent that the term engineering began to be applied in a number of non-traditional areas.

In this respect many attempts were made in the past to define the term engineering, but none of them were completely acceptable to all engineers. We may, however, present one of the closest definitions offered, that serves to show the wide range, technical and human activities that engineering encompasses and to indicate the extent of the information needs of the engineer.

Engineering can be said to be the profession in which a knowledge of the mathematical and natural sciences, gained by study, experience and practice, is applied with judgement to develop ways to utilise economically the materials and forces of nature for the benifit of mankind.*

It is clear from this definition that, an engineer, needs to be aware, not only of the current progress in his field of speciality, but also, of other fields of speciality that would enable him the proper conduct of his profession.

This paper deals with the peripheral or support type, information needs of engineers. Statistical, economic and market data can be classified in this category, as far as the engineers are concerned. This restriction in itself, however, narrows the field of users amongst engineers of this kind of data, limiting it in this case to consulting engineers, or those at advisory or policy making levels.

The paper also discusses the areas where such information is needed and the ways and means in which it can be collected or obtained, disseminated or retrieved.

The main text deals seperatly with statistical, economic and market data. It enlarges on the source of statistical data; official and otherwise and looks in detail at the centralized and decentralized systems of statistical data collection and dissemination.

---

* Engineers' Council for Professional Development

Although there is overlap between statistical and economic data; it is possible to point out the type of economic data in specific cases and in general needed by engineers.

Marketing data on the other hand seems to form one of the basic daily requirement of engineers, especially those engaged in design and implementation. Mention is also made of market research and other consumer-orientated surveys.

Finally a form of data bank system or a central service documentation centre is visualized by the author especially in developing countries in order to minimize time taken to obtain this kind of specialized data and reduce duplication and wasted effort.

2. The Nature of Engineering Activities and Projects

The process of preparing an engineering project, be it a physical entity, or a research and development undertaking, must be viewed as an iterative process having forward and backward linkages with the economic and social structure of society. It is obvious therefore, that an engineering project does not occur in isolation, but comes to being, usually, in response to some needs of society. In other words, amongst the preliminary inputs of the project would be data information, historical and factual, on the activities and characteristics of the society or the environment in which the project is to be initiated. Such data information is best provided by statistical, economic and market data.

With the exception of smaller engineering tasks, other engineering ideas can not by themselves help to provide decision making indicators as to the workability or the feasiblity of such ideas, when and if transformed into an engineering project. The initial idea may provide certain approximation of goals and basic parameters. The final decision may only be taken after the technical and economic feasbility of the "idea" is carefully checked and evaluated. This would greatly help to minimize the risk of uncovering new facts during the course of implementation; which might affect the overall efficency of the project. It is suggested therefore that the following aspects should be considered in detail.

2.1. The consumer, his needs and environments.
2.2. Available and applicable technology, including the best technical-economic solutions.
2.3. Local and external availablity of resources.

3. Hypothetical Cases

To demonstrate the above notion, a number of hypothetical cases based on real life projects, are presented. These represent major aspects of engineering undertakings.

3.1. A Petrochemical Complex

A major engineering firm was given the task of constructing a petrochemical complex in one of the oil producing countries. The firm started with an initial field survey to establish the economics, size and location of the project. The macroeconomic approach they used required the following data input;

- Population (number of inhabitants at base year).
- Gross National Product at base year.
- Per Capita GNP.
- Per Capita consumption of Plastics.
- Forecast-rate of growth of GNP. in "n" years time, and per capita forecast GNP.

– Forecast total consumption of plastics in "n" years and per capita forecast plastics consumption.
– Influence of the income distribution on consumption.
– Breakdown of population by income groups, base year and in "n" years.
– Plastics consumptions per capita for different income groups for same period.
– Forecast Plastics consumption in "n" years.
– Sectorial Analysis of the use of the various types of plastics (Who uses what?).
– Export market for plastics.
– Comparative analysis of international production, consumption and trade of plastics.

3.2. Water Supply Project

Data Required for the design and implementation of a water supply project and distribution network:
– Population (number of inhabitants in the area to be served).
– Forecast number of population in n^{th} year.
– Water consumption per capita (present and forecast) classified according to income groups.
– Seasonal variation in water consumption.
– Project economics.
– Climatic conditions and other ecological data.
– Gravity versus forced supply.
– Availablity of local building materials (cast iron or asbestos pipes).

3.3. The Development of Passenger Supersonic Jet Planes

The commercial factors and their impact on the project.
– The changing pattern of international flights.
– The future pattern of international business and trade.
– Consumer reactions (passenger surveys).
– Cost of initial development versus pay-out period.
– Cost of production and continuous development.
– Cost of running; fuel and administrative costs, etc.

Numerous other examples can be presented here, from industry, agriculture, transportation and communication, building and services and research and development. However, they all fall within the categories mentioned in para (2) above.

4. The Nature of Statistical Data

It is apparent form the above that all reasonably sized engineering projects require some kind of initial study, survey or feasibility study. The data input required for such a study can be obtained either from current statistics, published in a country by specialized agencies* or through a survey, specifically desighed for this purpose.

* Usually by the Central Statistical Office.

4.1. Current Statistics

Current statistics are one of the basic sources of statistical data information. It is provided on a regular basis, quarterly or annual, and covers nearly all fields of economic activities, in addition to general statistical data. The following is a brief description of the type of data to be obtained in annual statistical abstracts and specialized quartely bulletins.

4.1.1. Metorological data on climatic conditions, distribution of rainfall and temperature range and averge relative humidity, wind force and directions. This is regarded as essential for the proper design of a project, it's orientation, materials to be used, design specifications and durability of products.

4.1.2. Population and Demographic Data.

This deals with the number of people resident in certain areas or regions and on national basis. Such data is usually classified by sex and age, urban and rural, and by marital status, economic activities, educational status, and may include other characteristics such as migration trends, rates of growth, population densities, crude birth rates, marriages and divorse cases.

This kind of data is essential for assessing demand and working out future projections for goods, commodities and services. It would form the starting point in the feasibility study of any large engineering project.

4.1.3. Vital and Health Statistics, which includes birth and death rates and natural increases. It also includes information on the health situation of the population and number of doctors by speciality and nurses and number of hospital beds, sometimes classified by specialized medical use and other such data.

4.1.4. Agricultural Statistics

This covers data on net areas under cultvation, average yield and production of main and secondary crops classified by season and region, live-stock; animal production. In some countries, it might cover agricultural machinary and fertilizers used, irrigation projects, dams and reservoirs.

4.1.5. Industrial Statistics

The main items covered in this category deals with industrial establishments, average number of employees, wages paid, commodity and non-commodity input/output, branch of industry, production and value of sales, electricity and water supplies.

4.1.6. Construction Statistics

This deals with statistics of building permits and repairs, cost estimates of buildings, types of construction, average number of persons working in this sector classified by craft and specialization, total wages paid and quantities and cost of building materials consumed.

4.1.7. Transport and Communication Statistics

On the transport side, the statistics cover land transport, lengths of roads by type, number of vehicles classified by type of use, cars using the roads in-transit, quantities of goods and commodities transported by road, other public transport; the same detailed data may be found for railways and air and water traffic (river or sea). On the communication side, the statistics cover post, telegrames and telephones.

4.1.8. Foreign Trade Statistics

Includes principal imports and exports divided by country and commodity. This usually forms the backbone for any feasibility study for the establishment of new local industries.

4.1.9. Social Statistics; which includes labour and manpower statistics, data on social services, public utilities, justice and crime statistics.

4.1.10. Education Statistics

This covers all data on the various stages of the educational system and vocational training, including number of students, buildings and services.

4.2. Survey and Census Statistics

This kind of data information is obtained from occasional survey, or regular census and covers limited aspects of economic activities, like family budget surveys, agricultural or population censuses or fertility surveys. Special surveys may be launched to collect data for the specific requirements of a project.

5. Economic Information – Data

It is very difficult to draw the line between statistical data and economic data. All economic data can be called "statistics", but not vice versa. However, one can summaries the economic information data most likely to be needed by engineers as follows;

5.1. National Accounts figures; total and per capita income, capital formation, gross national product and gross domestic product.
5.2. Banking and Currency data.
5.3. Balance of payment, and public dept,
5.4. Public finance, budget, and income tax,
5.5. Prices and index numbers,
5.6. Insurance statistics and companies,
5.7. Expenditure on national development plans (in countries with central planning system),

6. Market Information – Data

Although this kind of information data is just as vitaly important to engineer as the previous two, it is not always readly available in usable formats. The type of data that falls under this category may be obtained either by special consumer or market surveys, or from manifacture advertisments and catalogues.

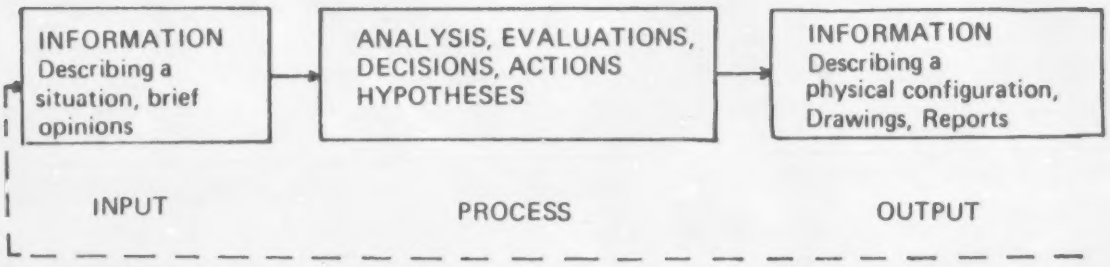
7. Data Needs in Engineering Practice

The engineering design and implementation process, is basically one of problem solving and adjusting to the needs and requirements of consumers or environments. Therefore, it follows a certain chronological order. The following phases can therefore be recognized as most common to all engineering projects; inception, feasibility, outline proposal, scheme design, detailed design, production information, preparation of bills of quantities,* tender action,* project planning, operation on site (or in Labratory), completion, (planning of production)*, (planning for distribution or dissemination, as the case may be)* and feed-back. Thus, an engineer's working procedure is organized, more or less, according to the above mentioned sequence and phasing.

(SEE THE DIAGRAM)

Each of these phases has an input. Information, in the form of statistical, economic and market data, forms the bulk of such an input. The process in each phase would include analysing the data evaluating the situation, taking action oriented decisions, and finaly perhaps setting hypotheses for the situation at hand.

* This need not be applicable to all engineering undertakings.



The output of the process would be either a form of physical configuration, drawings or reports. These will, as a result of the entire (input-process-output) cycle, form an accumulation of information and experience, to feed back to the next cycle or phase. The feed-back action is intended to yield data information about problem-solving experiences, the management of the engineering project, it's construction and later performance. The role of statistical, economic and market data information as inputs varies from one stage to another. The requirement intensities are highest at earlier stages of feasibility, outline proposals and scheme design. Market data however, especially those connected with materials and components, will be needed up to the final stages of the project.

8. The Source of Statistical and Other Relevant Data

One of the major sources of statistical data is official statistics, published by government agencies. The comprehensiveness of such data usually depend on the political system of the country. Socialist countries with a centralizied planning and management of the economy, have a very comprehensive coverage of all economic activities and issue timely bulletins and yearbooks. These cover all aspect of social, economic and educational activities. The central statistical offices are usually entrusted with this task. Other government offices may also issue their own reports and statistics, but with the prior permission or under the supervision of the central statistical office.

In Poland, the Central Statistical Office issues the "Consise Statistical Yearbook of Poland", in addition to the reports and other specialized publications. The central school of planning and statistics in Warsaw also has a number of publications on selected topics in planning. In GDR, the most comprehensive statistical source is the Statistical Yearbook issued by the State Central Administration for Statistics. The same office issues the "Auswahlbibliographie". In Romania, the Romania-Directia Centralade Statistica issues the Statistical Yearbook of the Socialist Republic of Romania. In Czechoslovakia, the Central Office of State Inspection and Statistics issues the Czechoslovakia Statistical Abstract and in Bulgaria the Central Statistical Office is intrusted with covering statistical data on all aspects of economic activities. In the U.S.S.R. the Central Office of Statistics, which is a very large organization and covers all the states, (this is in addition to the states' statistical offices) issues a multitude of bulletins and handbooks and reports covering very comprehensively all aspects of economic activities. Other sources of data publication in the U S S R can be obtained from the annual "Ezhegodnik knigi USSR" and from trade catalogues and important institutions like the Academy of Sciences Library.

In free-enterprise economies, statistical data are published, usually, in a decentralized maner, although there are central statistical offices in all the West European Countries, USA and Canada.

Data Requirement of Various Engineering Projects

Engineering Projects / Type of Data	Power and Industry	Agri-culture	Housing and Construc-tion	Transport and Communic-tion	Research and Develop-ment
Meterology	X	X	X	X	X
Population	X	X	X	X	X
Agriculture	X	X			X
Industrial	X	X	X	X	X
Construction	X		Y		X
Transport & Communication	X			X	X
Foreign Trade	X	X			X
Social Statistics			X		X
Educational State			X		X
Economic Data	X	X	X	X	X
Market Data	X	X	X	X	X

In the UK, for example, the Central Statistical Office issues the annual abstract of statistics which contains major statistical data. The Department of Trade and Industry (DTI)* issues reports on a variety of subjects which are most likely to interest engineers. "Sectional List No 3", for example, records the most important publications in the appropriate subject area. A number of other publications of interest to engineers are issued by the Department of the Environment**. These can be traced in "Sectional Lists No 5,22 and 61". Ministries of Labour, Education and Local authorities also publish their own statistical reports. Her Majesty's Stationary Office (HMSO), can invariably, offer a comprehessive list of publications on statistical and economic topics of interest to engineers.

In the United States of America, the Department of Commerce, Bureau of the Census is the main supplier of basic statistical data. Other Departments issue their own specialized statistics and reports, such as the Departments of Labour, Agriculture, Atomic Energy Commission, Civil Aeronautics Board, the National Bureau of Standards, the National Technical Information Service, Defence Department and the National Science Foundation. However, the US Government Printing Office publishes a wide spectrum of subject catalogues and guides and many of these contain Statistical, economic and market data.***

Australia's offical publications can be traced through the monthly catalogue or through the annual "Australian Government Publications" issued by the National Library of Australias, or through the weekly "Australian National Bibliography." In Canada, a comprehensive list of publications is provided by the "Canadian Government Publications; Monthly Catalogue", with an annual cumulation.

In France the Statistical system is more centralized, and annual abstracts are issued on a variety of statistical and economic subjects. For example "Statistic and Etudes Financiers" is issued by the Ministry of Economic and Finance, and "Statistique Agricole" is issued by the Ministry of Agriculture. In Federal Republic of Germany the most comprehensive source is the "Statistiches Jahrbuch für die Bundesrepublik Deutschland" which is issued by the Statistical office in Wiesbaden. Different provinces in FDR issue their own regional statistics.

In most developing countries, the Central Statistical Offices are the major supplier of data. These Offices are either connected to ministries of planning, national economy or to other higher institutions. It is obviously not possible in this limited dissertation to list all the institutions in all the developing countries. A comprehensive coverage however of all statistical data can be found in the United Nations Statistical Yearbook, which is published annually, and in other publications of UN agencies like the ILO, WHO, UNESCO, UNIDO, FAO, IAEA, ICAO, UNCTAD; to mention but a few.

9. The Need for a Centralized Information System on a National Basis

It can be seen from the previous section, that most countries have achieved an adequate level of organization, and establishment of the institutional frame for collecting, processing

---

* Formed 1970 by combining the Board of Trade with the Ministry of Technology. In 1974 these functions were diversified again into seperate Departments of Trade, Industry, Energy and Prices and Consumer Protection.

**Formed 1970 by combining the Ministries of Transport, Housing and Public works.

***Shmeckebier, L.F. Eastin R.B. "Government Publications and their use." Brookings Institution 1969.

– Monthly Catalog. United States Government Publications.

and disseminating statistical data. Again, depending on individual countries, the orientation of such data differs widely. Most central statistical offices are oriented towards economists, statistians and social scientists. In only a few countries das does CSO issue engineering orientated statistical data. In developed countries this problem is solved either through the centralized government agencies or the non-profit making organization or professional institutions and societies. In developing countries, however, attempts were made to imitate existing systems in industrialized countries, without due consideration to local environments and administrative procedures and capabilities.

It is difficult here to suggest a ready made system that would be applicable in all situations. Solutions and alternative principles can be given, however, for planning, developing and utilizing statistical, economic and marking information systems for engineers.

The first alternative can be directed at increasing the size of document base (yearbook, quarterly report, market surveys) through the use of network which connect a number of libraries or documentation centres to user sources. The purpose of this approach is to make available to engineers a much larger store of documents than is economically feasible within the context of a single agency or clearing house. This alternative would be oriented to solving problems of engineers not aware of relevant information in the field of statistics, economics and consumer needs.

The second alternative would be aimed at reducing total system response time through automation. This approach would be highly recommended if the volume of information and documents to be handled incrases beyond an acceptable level of processing.

The third alternative involves the establishment of a focal point, perhaps in an existing engineering institution or a semi-government agency or clearing houses and documentation centres, to collect, reproduce and widely disseminate titles, abstracts, bibliographies and reports issued nationally or internationally on statistical, economic and marketing topics.

The fourth alternative which may be in line both with the limitations in developing countries, and the narrow specialization of the subject matter – may be the establishment of a smaller information system or centre, specialized in focusing on the restricted inputs and selected dissemination of information to interest engineers. The idea is that not all engineers would need all the statistical, economic and marketing data that is published.

Finally, one can visualize a mixture of all the above systems. That is to say, a system providing each individual engineering practice with special information services. These special services involve some sort of treatment of the raw data contained in the documents. Such a special service may include only extracts from the basic document, or can be summary or review. It may also be designed around a computer system. Although these systems would vary in their institutional set up and operational characteristics, one of their common goals would be to assist the individual user by performing a range of operations and edditing on document stored information.

The objective from all these alternatives and special orientations of information systems, is to allow the practicing engineer to allocate a greater percentage of his time and basic professional specialization, to the creative aspects of the profession.

References

1. Bathurst, E. Peter (and others)
   Building Cost Control Techniques and Economic
   Heinemann, London (1973)
2. Carey, R.J.P.
   Finding and Using Technical Information
   London, Edward Arnold, (1966).
3. Foxhall, B. William (editor)
   Techniques of Successful Practice for Architects and Engineers
   MaGraw-Hill Book Company (1975).
4. Green Ronald
   The Architect's Guide to Running A Job
   Architectural Press (1962).
5. Gruenberger Fred (editor)
   Information Systems for Management
   Prentice-Hall (1972).
6. Hopf, S. Peter
   Designer's Guide to OSHA
   MaGraw-Hill Book Company (1975).
7. International CODATA Conference,
   4th Tsakhcadzor, Armenian SSR,
   June 24th-27th, 1974.
8. Newman, A. D.
   The Engineer in Society
   Peter Pergrinus Ltd. (1975)
9. Papnek, Victor
   Design for the Real World
   Paladin
10. UNESCO
    UNISIST synopses f feasibility study on a world science information system
    Paris, (1971).
11. Whittenburg, John A. and others
    Guidelines for planning a task-oriented information service system
    Ohio, Clearing House (1968).

TRAINING OF UNIVERSITY STUDENTS OF ENGINEERING IN THE USE OF INFORMATION

A. Neelameghan, INDIA

1 INTRODUCTION

Acquisition of information user capability by engineering students is receiving increasing attention. For example, several of the issues discussed at the Unesco sponsored International Conference on the Education and Training of Engineers and Higher Technicians /New Delhi, 20–26 April 1976/ imply the need to develop abilities of engineering students in the use of information. Consider for instance the issues:. . . the curriculum should aim at producing an ingenious, creative, innovative and employable engineer, who could collate, analyse, synthesise information . . . and be capable of planning and of relating technology to societal needs; . . . that trainees learn of aspects relating to the basic background necessary for long term professional development, entrepreneurship, and awarenese of environmental factors, national development plans, anticipated futuristic technological developments; . . . that the course be so formulated that the teacher becomes more of a stimulator than a primary source of information.

2 PREMISES

2.1 General with respect to Academic Community

Perception of the need for guidance and instruction in the use of information systems arises from a variety of experiences and interrelated premises such as the following:

/a/ "User needs" has been a major concern of library and information personnel in recent years as is evidenced by the increasing number of surveys, papers, conferences, etc, devoted to it. The objective of studies on user needs is mainly to develop criteria and guidelines for designing optimal information systems. A spin-off from such studies is the realization that few users know how to use information systems to advantage. The perfect information system, when developed, would of course, afford its maximal use with minimal difficulty. But such systems are a long way off in realization, and in the meantime user education and training could help better use of the existing less-than-perfect information systems.

/b/ In the academic environment, effective use of the library and information systems can lead to better student performance. Studies show that the academic community familiar with the working of information systems can use them to their advantage, whereas those who are unaware of or do not know how to use these systems effectively can gain little benefit from them. Therefore, user guidance and education are deemed to benefit students, teachers, and researchers.

/c/ Academic library and information systems tend to become complex in attempting to meet the growing needs and demands of users through incorporation of the developments in information handling methods and technology. Information is communicated increasingly through non-book media. On-line access to data bases on campus, off-campus, and even at global distances is becoming a familiar feature in some countries. Problems and difficulties in using information systems vary from one person to another. Some constraints are system-specific, others are user-specific. The new generation of students growing with the newer

systems will, in future, be capable of more effective use of them. But there exists a large proportion of the academic community for whom the sophistications are entirely new and need orientation and guidance in their use.

/d/ In the costing of research, academic programmes, etc, and in the assessment of information system efficiency and effectiveness an important factor is the time taken for information search, access, and document delivery. Therefore, use of information systems should be made as productive as possible. Orientation, guidance, and instruction in the use of information systems and services could increase the productivity.

/e/ Often faculty members are only vaguely aware that the bibliographic tools commonly used by them represent only a small part of a large network of bibliographical services and systems. Expert knowledge which arises out of years of study and experience in a specific narrow field may be mistaken for a comprehensive knowledge and bibliographical control of the literature of the umbral and penumbral areas of their interest. Carefully planned exposure of the faculty members to the wide range of information sources and facilities in their respective subject-fields easily points up the limitations of the extent of coverage of their self-documentation efforts and motivates their acceptance of information services.

/f/ Faculty members may not be fully aware of learning theories and instructional methodologies involving library and information resources. They may be indifferent to such possibilities. Library and information personnel can make a useful contribution in this respect by demonstration if done in an unobstrusive and discrete way.

/g/ In the undergraduate and graduate levels the library has a useful role in developing the intellectual and scholarly ability of students. There is evidence to show that ungraduate students who have had access to libraries and have used them effectively perform better in their undergraduate and graduate studies. But neither the faculty nor the students may be aware of this possibility. A user education programme would be a first step in gaining the faculty's confidence in the role and capacity of the information system as a support to their own efforts in developing scholarly attitudes in students.

/h/ It is generally accepted that efficiency and productivity in any field of activity – e.g. business, engineering, medical practice – can improve through effective use of information and information systems. However, a practitioner has little time for learning the effective use of information systems. Therefore, it is expedient that guidance, instruction and experience in using information and information systems be provided during his school and college career. Further, the academic environment is more conducive to such guidance and instructional programmes than would be a business house, engineering concern or a hospital environment.

2.2 Special with respect to Engineers

/a/ The engineer gathers information constantly in small bits – from observation, conversation/discussion, and reading. For many a practising engineer, this somewhat passive and barely conscious process represents almost all his information acquisition. He feels complacent that information acquisition is not a problem and that it is a minor task. Engineers need to realise that the passive, nearly subconscious process can be effectively supplemented by a planned dynamic information acquisition process to ensure more relevant information is obtained with minimal effort and the acquisition of obsolete information is minimised.

/b/ There is a difference between information acquisition by a student and by a practising engineer. Student work, particularly at the undergraduate level, requires very little search for information. On the other hand, in engineering practice there is a constant seeking for, often difficult-to-find, information. For the student, if the needed information is not given with the problem, the specific sources such as handbooks, tables, etc, are easily known. For the

practising engineer, on the other hand, each problem may present a unique situation requiring fresh observation, discussion and use of unconventional sources for the relevant information.

/c/ Studies of the information seeking behaviour indicate that in up to 25 per cent of their information seeking contacts, engineers obtain information from colleagues, whom they know, and that they depend to a significant extent on their own personal collection and on the departmental files. If the professional contacts are to be productive and synergistic and not degenerate into mere social contacts, then engineers should be well informed in their respective fields. This needs development of appropriate attitudes, habits and skills in the students that would continue to motivate them to seek information and services for keeping themselves updated.

/d/ Again, information problems in engineering is especially urgent because of the rapid introduction of new technologies such as computer applications in engineering information processing.

3 BENEFITS OF TRAINING IN INFORMATION USE

The overal objective of training of university students of engineering in information use is to achieve a significant improvement in general engineering education and specifically the overall competence of the engineering profession in information use. The direct benefits would be:

/a/ improved effectiveness in engineering through more creative and less time wasted, in overall engineering;

/b/ possible reduction in unnecessary duplication of effort;

/c/ improved efficiency in the acquisition of information, manifested in a combination of less search time and selection of more useful information; and

/d/ minimization of technological obsolescence.

The indirect benefits would be;

/e/ elimination of the need for elaborate user education and training at a later stage when the student becomes a researcher or practising engineer;

/f/ spread of good information practices more rapidly among engineers through the activities of informed, skilled and motivated engineering graduates;

/g/ greater demand for high quality information service from the informed engineers would be a stimulus tor improvement of engineering libraries and information services;

/h/ greater overal efficiency in the process of educating engineers; and

/i/ an understanding of the problems of information handling by engineering students could improve their subsequent preparation of abstracts and indexes, selection of information material for inputs to information systems, and in the long run, in the precise presentation of information, reduction in repetitious writing, etc.

4 APATHY AND RESISTANCE

While there is a fairly widespread appreciation of the need and value of user education and training programmes in the academic environment, there are but a few such programmes really successful in practice. In fact, one often encounters apathy and even resistance to user education programmes from students and faculty. Reasons for this include the following:

a/ Students and faculty tend to consider library instruction as something extracurricular and not germane to the educational development of students.

b/ Complacency arising from the belief that satisfactory experiences in the school library gives adequate competence in the effective use of the college library and information systems. This may result in or from an inadequate knowledge of the range of college library resources and services and of the difference in the school and college educational programmes.

c/ The persistence of the concept that a library lecture given during the school "library hour" on entering college will solve or build adequate competence for solving, all information search problems for all time.

d/ The misconception that ability to use the library catalogue is all that one needs for effectively exploring, accessing, and using library and information resources. Millicent Palmer points out that "The persistent Myth of the Card Catalog is . . a product of our past instruction emphasis, an emphasis that may have been relatively valid in the day of "The Book", before the literature of journals reports, government publications, conference between informed and uninformed scholars and students."

e/ The arrangement of the traditional library instruction centering around the card catalogue, classification, various indexes and reference books, including sometimes history of books and libraries, and practical hints on searching for information and telling students what they are expected to know, and assigning them some practice exercise often of no practical value and unrelated to their courses, appear to give some students a sense of security and competence in their approach to library and information systems. This feeling may be a false one and inhibit students and teachers from exploring the information sources further which they might have done otherwise.

f/ Martha Hachman further points out that: "Too often library instruction has served as a sort of procrustean device for filling students into a rigid system designed without consideration for their needs. The motives behind many such programs have had more to do with publicity, economy, or enhancing the librarian's image as a member of the teaching faculty than with the education of students. By and large, library instruction has been impersonal, mechanical, and above all, dull".

These factors individually and collectively not only produce no motivation to take the orientation courses and programmes, but also tend to raise apathy and resistance in students and faculty.

5 EDUCATION PROGRAMME FOR ENGINEERING INFORMATION USERS

5.1 Objective

The education in information use and management for university engineering students should be designed to /1/ enhance the student's awareness and appreciation of the value and use of information in engineering studies, research and practices, that information management is in fact the heart of engineering, and that an aggressive, systematic method of information management does produce a real benefit in the form of better engineering results; and more specifically, /2/ ensure that engineering graduates are adequately prepared to

/a/ identify their specific information needs in relation to a specific situation encountered;

/b/ precisely formulate their information need in the forms both for SDI and retrieval query;

/c/ develop attitudes, habits and skills that would enable them identify and choose information channels and sources with confidence and foreknowledge of the probability of

success – the sources include conventional library facilities and standard reference works as well as the newer ones such as technical information centres, information analysis centres, data banks, computer-readable data bases, etc; /d/ use different information media, systems, and services effectively; /e/ develop ability to conduct a conventional information/ literature search both in association with /or by directing/ a professional searcher and by doing it themselves; /f/ evaluate and productively utilize the information obtained in relation to the problem in hand; /g/ get a general knowledge of the basic principles and operational components of information systems needed to help the engineer; /h/ produce new knowledge and perform better in the specific areas of their respective concern; and /i/ achieve a fair amount of competence in expressing and preparing information reports for use by others.

5.2 Future – Career Orientation

The student of today would be a practising engineer in a few years. Therefore, in developing a programme for introducing information use and management as an integral part of the engineering curriculum, the training would be for the student as well as for the would be practising engineer. The graduating student should be enabled to envisage the roles and activities of a practising engineer, and exposed to the different information sources, channels, and systems available to support the engineer's work (See appendix 1). The career stages include: student, junior engineer (apprentice/junior recruit, more experienced), intermediate engineer, and senior engineer. Roles include research, practice, entrepreneurship, management, and linkage between research and practice. Information needs and sources used vary with the career stage and role. Students should be exposed to specific types of information used by engineers, e.g. design methods, product information, model studies, patent, site information, codes of practice, standards, regulatory information, equipment and product information, computer programmes, etc., and their sources – documents, institutions, projects, and people. (See appendices 2, 3, and 4).

5.3 Topics for Seminars, Courses, Workshops

The topics suggested here can form a basis for formulating a set of course modules for the different groups.

A. Information and Society

Sociology of information: generation, collection, utilisation, and impact of information. Information environments. Role of information in development. Information as an aid to planning, decision-making, management, research and development. Economics of information.

B. Use of Information

Stages and steps in research, problem solving, decision-making learning; technology transfer, etc. Information needs at the different stages in different areas – basic research, applied research, exploratory research; planning, policy making, management; design, production, engineering; marketing; public relations; extension services, etc. Types of information for the different user groups – teaching staff, research workers, technical and engineering

personnel, management personnel, technicians, technology transfer personnel, etc.

C. Information Transfer and Dissemination

Inadequacy of self-service' in information; inter- and trans-disciplinary nature of information/knowledge; acceleration in the rate of production of information; accelerated rate of obsolescence of information; information communication media and methods; barriers to communication – language, culture, economics, scatter and seepage, 'pollution', physical accessibility.

Information Services – structure, function, use; current awareness, SDI, referral, pathfinders, retrospective search, information bulletins, digests, state-of-the-art reports, trend reports, information analysis. Document delivery systems; translation service; reprography service.

D. Information Sources and Systems

Primary and Secondary documents; institutional sources; individuals as information sources, libraries, documentation centres, information centres, information analysis centres, data banks; structure, function, and services. Local, national, regional, and global information systems, networks and programmes.

E. Information Handling Tools and Techniques

User interaction with information systems. Structure, function, and use of basic information handling techniques and tools – classification systems, thesauri, catalogues, computer-based systems.

F. Personal Information Files

Selection and extraction of information pertinent to interest; recording and organization of personal information files; simple indexing and retrieval systems.

G. Presentation of Information

Technical writing and presentation of ideas; structure, format and preparation of papers, reports, etc. Abstracting, condensation, digest preparation; tables, graphs, charts – presentation and preparation.

5.4 Approach and Facilities

The course in information use and management may be introduced in the basic engineering courses, basic disciplinary courses, and in graduate level courses. In addition to the regular curriculum integrated programmes, there could be short courses, seminars, workshops, on-the-job training, apprenticeship for training in information use. In addition to class lectures

and discussions, visits to systems, centres, sources and services, practical exercises and demonstrations of information use should be arranged. Such programmes should be supported by a well-staffed good engineering reference library, and human, material and laboratory resources and inter-institutional cooperation; and on-line access, where reasible, and opportunity to work at computer terminals is desirable. It has also been feasible helpful to incorporate information handling experience as an integral part of the engineering apprenticeship programme for new recruits.

6 POLICY

Adoption of appropriate academic policy and library/information policies would facilitate incorporation of the training in information use programme as an integral part of engineering courses.

6.1 Academic Policy

In order to facilitate the effective operation of user education programme, it is highly desirable that academic policy covers, among other things, the following:

a/ Considering the acquisition of experience and proficiency by students at all levels in the use of library and information systems as an educational objective to be achieved.

b/ Considering the education and training in the effective use of library and information systems as an integral part of the education programme.

c/ Designing the curriculum in such a way as to provide students adequate opportunities for self-instruction through independent study involving use of library and information systems and services.

d/ Making work on a project involving guided research and independent inquiry as a prerequisite for graduation.

e/ Use of instructional methods such as, seminars, colloquia, workshops, clinics, etc involving prior "library research", information analysis, and synthesis, at the college level.

f/ Provision of adequate funds and facilities for user orientation and education programmes as an integral part of the academic programme.

g/ Inclusion of information staff in key faculty committees such as the curriculum committee in order to provide for adequate interaction and participation of the library and information personnel in the academic programmes and activities.

h/ Recognizing the educational role of library and information personnel by awarding academic status to these professionals.

6.1 Library and Information Policy

The effectiveness and efficiency of user education programmes should be assured by adopting appropriate library and information policies. They should cover, among other things, the following:

a/ Guidance and instruction in the use of library and information systems should be considered as an integral part of library's functions and professional responsibilities of the information personnel.

b/ The library and information system should assume a positive and active role in meeting the educational purposes of the institution.

c/ In order to get the highest payoff from the library's contribution to the education programme, the library and information staff should work with and through the faculty in designing programmes to influence student behaviour in using library and information.

d/ Since the potencial for and nature of collaboration between library and faculty varies from discipline to discipline and from individual to individual, the library should be alert to possibilities at both levels.

e/ In designing user education programmes, the library and information personnel should be sensitive to the difference in the mass approach at the school and undergraduate library and the individual scholar approach in the university library system.

f/ Library activities and programmes should be so designed and the library and information staff should be of such quality that productive collaboration with the teaching faculty is facilitated. For example, the library staff interacting with the undergraduate programme, should have in addition to their professional competence in the information field, a high level liberal arts background, a certain commitment to the teaching enterprise, and a thorough understanding of curriculum design, learning theory, and instructional methods.

g/ User education programmes should be designed to be flexible – adaptable to the different student levels and faculty needs, allow the use of various instructional media and methods, include a built-in feed-back mechanism, and facilitate innovation and easy implementation.

h/ Library and information activities and programmes should be derived from and reflect, the changing concept of library and information systems – e.g.

1/ Their dynamic participative role in the educational programme.

2/ Their future information environment and future task orientation.

3/ As a system and network in which information flow to points where it is needed rather than as a 'building' to which people come for information.

4/ Their user-centred and service-centred, rather than technique-centred activities.

5/ Their ability to use multimedia in information transfer, rather than being solely book-based.

7 ISSUES AND RECOMMENDATIONS

National governments and non-governmental organizations and international bodies such as the Unesco and the WFEO should support, promote, and encourage:

7.1 Projects for making national and regional inventories or compilation of profiles, of university training programmes for engineering students in information use and management, giving adequate details of objectives, types of participants, duration, methodology of training, facilities, etc., for each programme, and ultimately develop a world data base and directory of such user education programmes for practical and research use by members States and interested organizations.

7.2 Development of means and mechanisms for sharing of experiences in the university training of engineering students in information use in different environments in different countries.

7.3 Study of methods best suited for training engineering students in information use at different levels and stages and drawing up guidelines for the organization, conduct and evaluation of information use programmes in universities.

7.4 National and regional programmes in universities for the training of engineering students in information use and management.

7.5 Efforts to ensure that national and international seminars, conferences, etc., on the education of engineers include discussions on information use education also.

Appendix 1:

Information Needs and Sources According to Career Stage
/Example: Earth Science Engineers/

CAREER STAGE	DUTIES/ RESPONSIBILITIES	DOMINANT INFORMATION NEED	INFORMATION SOURCE MOST USED
1. STUDENT	ACQUIRE BACKGROUND KNOWLEDGE, SKILIS/NO PROFESSIONAL DECISION MAKING	BASIC SCI. AND ENGIN. KNOWL. EXPERIMENT AND DESIGN PROCEDURE; COMP PROGRAMS; CASE HISTORIES	ORAL: LECTURES, TUTORIALS, COLLEAGUES, DOC: TEXTBOOKS HANDBOOKS, RECOMMENDED PAPERS
2. JR.ENGINEER (FRESH)	ROUTINE TECHNICAL WORK IN DESIGN; FIELD LAB; PRODUCTION/ROUTINE DECISIONS WITHIN DEFINED GUIDELINES; SUPERVISE TECHNICIANS	LOCAL TECH. DATA, DESIGN METHODS, PHYSICAL DATA, MODEL STUDIES, SITE INFO. COM. PROGRAMS	ORAL: SUPERVISOR, COLLEAGUES. DOC: TEXTBOOKS, HANDBOOKS, MANUALS, CODES OF PRACTICE, MAPS.
3. JR.ENGINEER (LATER)	PROBLEM SOLVING WITH STANDARD TECHNIQUES; ASSIST IN CALCULATIONS DESIGN, FIELD TESTS/DECISIONS WITHIN DEFINED GUIDELINES; GUIDE NEW JUN. ENGIN.	–DO–	ORAL: AS FOR 2. DOC: AS FOR 2 PLUS RECOMMENDED PAPERS, REPORTS; REVIEWS; BIBLIOGRAPHIES
4. INTERMEDIATE ENGINEER (START WITH)	EXECUTE ENGINEERING ASSIGMENTS / INDEPENDENT STUDY, ANALYSIS, CONCLUSIONS DIFFICULT DECISIONS REFERRED UP. SUPERVISES JUN. ENGIN.	–DO–; and SPEC. KNOWL. NEW METHODS, GOVT. REGULATIONS, EQUIPMENT INFO. WHO'S WHO.	ORAL: SENIOR ENGINEERS, COLLEAGUES, CLIENTS, CONTRACTORS, CONTACTS AT MEETINGS, CONFERENCES ETC DOC: AS FOR 3 PLUS ABSTRACTS LITERATURE SEARCH SDI, TRADE CATALOGUES, DIRECTORIES

CAREER STAGE	DUTIES/ RESPONSIBILITIES	DOMINENT INFORMATION NEED	INFORMATION SOURCE MOST USED
5. INTERMEDIATE ENGINEER (LATER)	SUPERVISE ASSIGNMENTS/ WORK ASSIGNED IN TERMS OF OBJECTIVES. RESPONSIBLE FOR SUCCESS OF ASSIGNMENT	AS FOR 4.	ORAL: AS FOR 4 DOC: AS FOR 4
6. SENIOR ENGINEER	ADMINISTER WORK PROGRAMME DECISIONS ON POLICY, FINANCE, RESOURCES; COORDINATE WORKS; STAFF APPOINTMENTS	ESPEC. CASE STUDIES, NEW METHODS, REGULATIONS, EQUIPMENT INFO. WHO'S WHO, BUSINESS AND GENERAL ENVIRONMENTAL INFO.	ORAL: AS FOR 5, PLUS ADMINISTRATORS, GOVT. DEPART. EDUCATORS. DOC: AS FOR 5, PLUS GOVT. PUBL. COMMERCIAL REPORTS

Source: A GRALEWSKA-VICKERY; COMMUNICATION AND INFORMATION NEEDS OF EARTH SCIENCE ENGINEERS.
INFO. PROCES. MANAG. 12; 1976; 251-82.

Appendix 2: TYPES OF INFORMATION NEEDED (EXAMPLE: EARTH SCIENCE ENGINEERS)

TYPE OF INFORMATION	USER				INFO. TYPES				SOURCE								VALUE (TIME)		AVAILA-BILITY	
	STUDENT	JUN. ENG.	INT. ENG.	SEN. ENG.	TECH.	PROJECT	PROFESSION	NON-PROFESSION	TEXTBOOKS	JOURNALS	REPORT/SP PUB.	HANDBOOK	MAPS, MET. RECORDS	ENGIN. GEN	PATENT		CONTINUING	QUICK OBS.	PUBLIC	PRIVATE
DESIGN METHODS	X	X	X		X	X	X		X	X							X		X	
DATA					X	X				X	X	X					X		X	
PRODUCT INFORMATION	X	X	X	X	X	X			X	X	X	X		X	X		X		X	X
PROCESS INFORMATION	X	X	X	X	X	X			X	X	X			X	X		X		X	X
MODEL STUDIES		X	X		X	X			X	X	X			X			X		X	
CASE STUDIES	X	X	X	X	X	X	X		X	X	X						X		X	
SITE INFORMATION		X	X	X	X	X					X	X	X	X			X		X	
NEW METHODS			X	X	X	X			X	X	X				X		X		X	
CODES OF PRACTICE		X	X		X	X					X	X					X		X	
STANDARDS	X	X	X		X	X					X						X		X	
COMPUTER PROGRAMS	X	X	X		X	X								X(1)						
EQUIPMENT INFO.			X	X	X	X				X	(2)							X	X	
GOVT. REGULATIONS			X	X	X	X	X	X		X	X							X		
BUSINESS INFO.				X		X		X						X				X		X
BIBLIOGRAPHICAL INFO.			X	X	X		X							X				X	X	X

(1). ALSO AS PROGRAM PACKAGES FROM COMPUTER CENTRES
(2). TRADE CATALOGUES

SOURCE: A GRALEWSKA–VICKERY: COMMUNICATION AND INFORMATION NEEDS OF EARTH SCIENCE ENGINEERS. INF. PROCES. MANAG. 12; 1976; 251–82

Appendix 3:

INFORMATION REQUIREMENTS OF SMALL INDUSTRIES

Scope and prospects for industries

Items reserved for small industry sector; items having good prospects in the area; banned industries; items for subcontracting; import substitute items; products having export potential; items in short supply; items getting government priority; items successful in the vicinity.

Location, land, and building

Location of growth centres; availability of land; availability of sheds in industrial estates; types of sheds; infrastructural facilities – water, transport, communication, power, market; special facilities required; factory building; dimensions, drawings, lay out, cost/rent and owning.

Machinery and equipment

Capacity, specification, description, models of machinery and equipment needed; local availability and importation; sources of supply and cost; capacity for spare time jobs; performance; availability of second-hand machinery; hire-purchase schemes; leasing out.

Raw materials

Composition and specifications for raw materials; standards; quality and quantity required; availability and importation; sources of supply and terms; government allocation policy; subcontractors; cost.

Utilities

Coal, coke, oil, lubricants, power, water, etc.; availability; quantity required; supply sources; cost.

Transportation

Transport facilities for raw materials and finished products.

Staff and labour

Availability of skilled labour; training institutions; personnel selection policies and methods; wage rates; labour laws; participation in management.

Finances

Cost per month; working capital requirements; total investment estimates; breakeven point; sources of finance; terms and conditions; seed capital facilities; government concessions and incentives; rates of interest; payment and repayment conditions.

Regulations and procedures

Industrial policy of government; rules and regulations; procuring letter of intent, licences and permits; sanction of sheds in industrial estates; procurement of machinery; power connection; patents, trademarks registration; government incentives; import licensing policy; scarce raw material procurement; financial assistance; national financing organisations; loans procedure; obligations and terms and conditions on loans.

Market strategy

Marketing channels; subcontracting, ancillary unit development; dealers' performance; commission; shop in open market; publicity; distribution centres; bulk purchasing agencies; government stores purchase procedures.

Appendix 4:

INFORMATION SOURCES USED BY SMALL INDUSTRIES

Information sources	Information for/on
1 Agents, dealers, distributors	Scope and prospects for industries; demand and market for products; market strategy; raw materials; technical aspects.
2 Documents	Technical aspects; raw materials; machinery; utilities.
3 Competitors	Demand and market for products; raw materials; technical aspects.
4 Consultants	Technical aspects; machinery; raw materials; financial aspects.
5 Customers, consumers	Demand and market for products; market strategy; technical aspects; raw materials; financial planning.
6 Employees in industries	Skilled labour; raw materials; some technical aspects.
7 Established entrepreneurs	Demand and market for products; scope and prospects for industries; utilities; financial aspects; raw materials; manufacturing aspects.
8 Exhibitions	Machinery; raw materials; techniques.
9 Self-experience	Scope and prospects for industries; demand and market for products; land and building for factory; machinery; technical aspects; financial planning; utilities.
10 Financing agencies	Financial planning; finances.
11 Friends	Land and building for factory; scope and prospects for industries in the area; staff; marketing; financial aspects; raw materials.
12 Govt. Info. Centre	Scope and prospects for industries in the area; demand and market for products; regulations; financial aspects; land and building for factory; raw materials; utilities.
13 Newspapers	Staff and labour; marketing; machinery; land and building for factory; financial aspects.
14 Small industry advisory cells	Financial aspects; machinery; raw materials; scope and prospects for industry; demand and market or products; utilities; land and building for factory; staff and labour; technical aspects; regulations; procedures.
15 Training institutes	Staff and labour; technical aspects.
16 Industry associations	Demand and market for products; utilities; financial aspects; technical aspects.

USER TRAINING AS A COMPONENT OF THE PLANNING AND MANAGEMENT OF TECHNOLOGICAL INFORMATION SERVICES

I. Wesley-Tanaskovic, YUGOSLAVIA

The social implications of communicating knowledge are such that only the widest social base is acceptable for planning (and managing) information services. The recognition that specialized knowledge resp. technological information constitutes a resource for social and economic development has led to the establishment of national technological information systems in both industrialized countries and those undergoing the process of industrialization. This recognition is worldwide: all countries are aware of the role which specialized information plays in their economy. Solutions may vary, but the problems are similar.

It is in response to this new perception of the value of technological information for economic and social progress that individual countries have redoubled their efforts to plan and manage specialized information services in recent years. These activities have reinforced the effort of both national and international professional associations of scientists, engineers and information specialists to help improve the transformation of specialized knowledge into productive uses by facilitating access to its record.

Today, the planning (and management) of technological information services is generally carried on at two levels: the national over-all planning and the planning and management at the level of the individual services.

At both levels of planning the main objective is the satisfaction of information users needs. Therefore the user, as the ultimate justification of all information work, cannot be excluded from the considerations of information service planners and managers. Even more, users should be actively involved in planning and implementing new information services and in evaluating the performance of existing and experimental services.

Though it may be a truism to say that the best designed and technically advanced information services are of little or on value unless users who need information utilize these services effectively, it is well known that present technological information services are generally under-utilized. This is a paradoxical situation: on the one hand information needs are increasing, on the other hand, existing and new information services run the risk of being used only by a small proportion of users who actually would benefit from them. This conflicting situation is today aggravated by the appearance of modern services, more sophisticated and costly, requiring even more time, effort and expenditure from the user. Thus, it seems that the incorporation of the user community into the planning and management of technological information services has become peremptory.

The active engagement of the users in the process of designing technological information services at all levels would undoubtedly contribute to solve the problem, but in order to achieve this goal two conditions are to be fulfilled: first, the users should be convinced that it is worthwhile to devote time and effort to this planning exercise, and secondly, they should be able to understand the problems inherent to the transfer and handling of information. It is obvious that prospective and actual users of technological information systems should be properly educated in this direction and trained in the required skills.

Further, in spite of the general recognition of the necessity of the wider application of specialized knowledge to productive work, members of the technical communities have great difficulties in recognizing their information needs clearly, they often do not know how to state

them explicitely – this should be taught at universities and later in refresher courses, workshops, seminars etc. included in the life-long continuing professional education programmes.

Confronted with a variety of more or less suitable information services, for convenience the users often grasp the first offered or the nearest one, either because of a lack of awareness or a lack of ability to assess them. Sometimes, also because nothing better is available. And, again, adequarte training of the users is of primary importance.

Moreover, the intellectual as well as technological progress of the information work in practice and theory is dependent on the creative input from the side of users of technological information services, who by constructive criticism contribute to their development. It goes without saying that only versatile users are able to do so.

Here are briefly stated some of the main aspects of the fundamental role of the further development of technological information services. Basic is the notion that the user should not "adapt" to the existing or future services, on the contrary the services must be appraised and continuously reappraised in the light of user needs. These needs, the user must be taught, at the university preferably, how to recognize and state them clearly, and later during his professional life, how to best satisfy them at the each stage in the progress of science and in the development of information technology.

In that way education of users become nowadays the key issue in planning /and management/ of technological information services.

At the national level the organization involved with technological information planning should formulate and implement the user education programmes in correlation with national educational authorities and the corresponding professional societies, ensuring that academic (university) training and continuing life-long education in information handling be incorporated into the existing professional education programmes for the technical communities. Obviously, a knowledge of the professional field implies practical competence in the handling of its information resources, though such study has been neglected by undergraduate and graduate education generally. In user education especially at the academic level, the fact cannot be ignored that the need for technological information is not an innate driving force. The information seeking behaviour should be developed by training and education into a deeply rooted habit. Moreover, today it is as important to the welfare of mankind that knowledge be acceptable to the general public as that it be shared among the technical communities. Basic user training in information handling becomes thus a component of nation-wide educational planning.

At the level of planning and management of the information services the users should be actively involved in designing and testing individual experimental services, which is by itself a very efficient mode of training. The implementation of new services must include provision for instructing users to handle information deciding what to retrieve rather than just how and to assess the degree of satisfaction of their needs by the services offered. The continuous monitoring of user satisfaction should be provided on a regular basis by all technological information services, which must be flexible and designed in such a way as to readily adapt to changing needs and advanced technology. But there are serious problems of "utilization" or application of knowledge to be tackled also.

Because of limited resources available for information in general a major problem is how much to allot to user training as opposed to other information – related activities. Up to now, user education and training appear to be generally neglected in comparison with the establishment of technological information services, often resulting in the latters poor utilization. On the other hand, it is frustrating for the users if their roused expectations cannot be satisfied by concomitant development of information services. Therefore, it is crucial that user information awareness and handling skills go hand in hand with the provision of services.

However, it is generally felt as preferable if user education goes slightly ahead, so that the users exert pressure requiring innovations.

Provided that the users learn at school from their teachers how to recognize and state their information needs, the main contribution of information specialists, operating technological information services, to the training of their respective users would be to teach them how to measure the performance of a service in regard to user satisfaction. This implies that the users be regularly informed on the technological advances in the capabilities and operational characteristics of existing and new services.

This is the outline of a long-term policy for information users education and training. It is obvious that at the national plane it should be decided which forms and techniques of education and training should have priority, given limited resources, in particular whether to concentrate at the academic level, on training of undergraduates or postgraduates and at the services level, on training of actual or prospective users in industry, agriculture or other branches of the economy.

Finally, in order to set up user education and training programmes within the over-all planing of technological information services, it is necessary that the national organization responsible for information should determine in broad terms the extent of knowledge and ability among all categories of users about how to find und use information. As a result, the programmes should be formulated and implemented in collaboration with the appropriate educational institutions and professional user associations. The skills of subject lecturers, of education experts and of information specialists should be used in combination in developing user education programmes. The design of a general programme for adult education should be given early attention also in cooperation with the national broadcasting media.

METHODOLOGY OF TRAINING INFORMATION USERS

J. Kuglerova, ČSSR

Introduction

Methodology of training information users represents a complex process aimed at the achievement of effective use of information in science, research, production and all other areas of national economy. The first requisite is the definition of measures which should be carried out in order to apply all those aspects that can accomplish the given aim.

In our understanding, methodology in general is a complex of measures, procedures and means applied to achieve a certain aim. As far as education and training are concerned, methods and means used in such domains as pedagogy, didactic and psychology should be taken into account in the first place.

The determination of correct methodology in training should be the result of, and be based on, the study and the analysis of the object of education. Two approaches to training should be differentiated: an approach chosen when dealing with the education of students in schools should be quite different from that with adults who have been engaged in any kind of production process. That is why the methodology of training of these two major categories of information users should be different.

College and high school students tend to absorb new knowledge with greater ease, preparation for future jobs is their primary duty and their engagement is stimulated by a system of evaluation of new knowledge and know-how as they acquire them. For adults participating in practical activities the stimulation is rather complicated, their training should embrace and forms that are not imposed on them and that ensue from the requirements of these workers.

These general rules as stated above should be applied to the training of information users.

Categories of information users

Training of information users should be based on individual as well as group needs of these users. It is necessary to differentiate between the following two major categories:

I – adults employed and participating in a working process;

II – college and/or high school students.

In case of category I, the training should be based on the nature of activities performed by information users, the area they work in and their information requirements.

In the process of informational training proper a different approach should be applied in relation to types of information workers. One should attach primary importance to the nature of their work.

Creative workers should study information sources, should know the existing systems of international bibliographic and research services, how to get access to information in a most expedient way, should have mastered methods of scientific research, methods of building up personal documentation and of how to transform the results of their creative activities into a written form arranged in logical order. These workers should be thoroughly familiar with information systems at home and abroad, of all forms of primary and secondary information sources. They should be trained to do independent research and be proficient in technical writing of all types.

Management staff workers who, for the purpose of decision-making need a rather broad scope of information, particularly surveys of the existing situation in relation to a given problem, as well as economic information, should be supplied with the knowledge of different

systems of scientific, technical and economic information and of the integration of such systems into the system of management. Of importance are data on the organisational structure of STEI and on different sources of information.

Production workers, both engineering and technical personnel engaged in both production processes and in non-production spheres, need factual information in operation research as well as production control techniques and specifications of products and materials. Commercial and economic staff workers need market research information such as price lists, surveys of world market, analytical studies of the development and availability of different products, production programs of individual firms.

With this type of user, the training should be oriented at different sources of factual information, at working places and systems that process corresponding information, and lastly, at the possibilities of acquisition of such information.

However, optimum time for informational training of information users is during their vocational education at colleges and universities.

The methodology of training these users can be planned, it may make full use of all modern techniques of teaching and, most important, it can produce in students permanent habits as to the provision of information for any creative activity.

From the point of view of content, informational training is carried out in three stages. These are as follows:

1/ bibliographic and library – related training aimed at the familiarization with the possibilities and the methods of use of services rendered by information and bibliographic centers and scientific libraries;

2/ informational training aimed at conducting research surveys and the familiarization with the use of world information sources and services available in the form of reference editions and address information services;

3/ techniques and fundamental principles of scientific research – methods of preparation of papers such as e.g. scientific studies, research papers, special articles and/or familiarization with related activities such as editorial and publishing, fields, with copyright laws, preparation of lectures etc.

This concept has been implemented step-by-step at the Agricultural College at Prague – Suchdol where programs of instruction include lectures in accordance with the steps outlined above, and where a manual for students "Guide to Scientific Work" by Ing. L. Holečková was issued.

This training may be implemented in different forms, namely:

1/ mass media which involve a larger number of workers and are characterized by a certain measure of generality.

These include:

a/ special films popularizing scientific, technical and economic information and instructing users as to the possibilities of acquisition and utilization of information;

b/ expositions and exhibitions oriented at primary and secondary documents in certain areas, acquainting viewers with the activities and services of information centers and describing for them the possibilities and effective performance of information work in individual specialized branches;

c/ television and radio programs on scientific and technological progress with a particular stress on the role of scientific and technical information;

d/ special manuals for users containing basic data on information science and its applications to different branches of science;

e/ lectures about scientific and technical information and methods of creative work;

f/ study visits to centers of scientific and technical information;

2/ individual forms which involve information users as individuals and provide information in different centers of scientific and technical information.

These include:

a/ consultations of procedures as to the acquisition and the utilization of specialized information and the functions of information systems;

b/ individual study according to a plan of personal training of a particular worker.

While making use of methods indicated above, one should be aware of whether the training is to involve a group of college and/or high school students or a group of workers engaged in practical activities.

For college students the whole range of training methods may be applied.

1. One of most common methods is that of a lecture with a subsequent control of knowledge in the form of an examination.

2. Various possibilities are offered by a seminar which provides enough room for active participation by students during seminar discussion and for the confrontation of their views as to the solution of problems under study.

3. Preparation of a seminar paper which tests the capabilities of a participant to solve a given problem on his own. The information task given to him may be combined with the solution of a special problem, with a task to make a research survey of a given problem and its evaluation.

4. Practical exercises, aimed at the acquisitions of capabilities for turning theoretical knowledge into practical applications and the acquisition of necessary skills. For instance, these may involve identification and summarization of factual data from a certain set of information data and documents, especially at a higher level of college and university education during the first or the second year of college and/or university education practical exercises such as identification of information sources in catalogues and card files or the preparation of entries into a record with all bibliographic data necessary to identify a particular document, may be introduced.

5. The participants test and verify the methodology of their creative work while they prepare and write their theses. In fact this work represents a certain algorithmization which should become a permanent habit of creative workers later on in their professional careers. Any creative and inventive work starts with a servey of an existing situation as it is reflected in available information sources.

6. Familiarization with the activities of information centers and libraries preferably should be encouraged through visits to specialized places of work, followed up by discussions.

7. Solution of problems that the user faces in his particular job is indeed an appropriate method of training information users. The problem to be solved should be determined by the instructor, who should also, if necessary, make corrections of the procedures suggested by students.

8. Connected with the afore-mentioned method is also the method of case studies; increasingly this method has been applied in the process of training management staff personnel. A case study represents a contrast to a real situation and to a problem set forth artificially.

9. Participation by information users in the process of location and identification of information may be carried out through the practical field work of student users in information centers and libraries.

It is appropriate to make use of available didactic techniques and traditional teaching aids in the process of training information users. Above all, they include:

1/ study texts of different orientation, content and form which comprise general methodology of information work;

2/ text books oriented in each case toward a certain branch of science, which have the form of qualified guides to specialized literature;

3/ articles or data included in text books of special subjects where data on sources and the utilization of scientific information are integrated with a given branch of science;

4/ slides, accompanied by commentaries (visual and audio – visual methods) which are appropriate e.g. while giving lectures on information systems, information flows, algorithms, methodology of creative work, etc.;

5/ instructional films about information services and how they may be used.

One such film is "On the paths to technological future" made in 1967 by the Short Film Company Prague (Kràtky fiim Praha) for the Central Office of Scientific, Technical and Economic Information. The film follows the path of a user – as design engineer who is looking for information in the process of solving a concrete task. It shows the versatility and the proliferation of information sources and data, various possibilities offered to information users and the ways that information may be used.

The most appropriate time for informational training of information users is considered to be the time of their college education.

It is recommended that the training at the college (university) level be divided as follows:

1st year of education: familiarization with the services rendered by specialized libraries in a given branch, and with the acess to their funds; familiarization with basic information sources in the branch;

2nd year of education: extension of knowledge gained during the first year, methodology of individual study of special documents.

Recommended methods: lectures, seminars, visits to information centers, practical exercises;

3rd and 4th years of education: methods and techniques of research, basic principles of scientific work. Preparation of thesis.

This stage includes:

- research surveys;
- how to set up a study paper, research report and scientific work;
- acquisition of knowledge necessary to publishing work;
- information systems related to different management systems.

Recommended methods: lectures, seminars, visits to information centers, practical exercises, discussions, problem solving, case studies, etc.

In order to ensure systematic training of information users it is first necessary to prepare adequately the teaching staff in the course of college and high school instructional education.

At present the teaching staff for informational training of information users is recruited from the following categories:

- personnel in information and bibliographic centers and scientific libraries;
- college (university) professors in the department of information science;
- college (university) professors of special subjects.

In relation to all these categories it is necessary to work out a uniform approach to lectures, this being done in the form of guides, seminars and short-term courses.

The informational training of users is a complex process which requires team work in order to be carried out with success.

TRAINING FOR ON-LINE USE OF DATA BASES

J. E. Creps, USA

I have been asked to present a report on the state of the art of, "Training for on-Line use of Data Bases." My remarks are directed to those of you who represent the engineering profession or are information specialists for that profession.

First, one must ask why such a topic should be considered at an International Symposium on Technical Information and Its Users. The transfer of information is not a new activity within the Engineering Profession. For example, Engineering Index, as an information service, has served engineers since 1884. However, the recent development in electronic processing, storage, retrieval, composition and communication has thrust the transfer of information into a revolutionary era. This new era provides the engineering profession with new and powerful tools here-to-fore undreamed of, and at the same time, new and unrealized responsibilities. In fact, these new tools have created a newly identified community, the data base community. Now, within this community we have a new need – the need to train for the utilization of the tools at our disposal. Just as when the automobile was invented people had to be trained to make use of it.

Dr. Martha Williams reported on December 1, 1976 at the meeting of the European Scientific Information Dissemination Centers Conference in Graz, Austria the following facts regarding the growth of these new tools. I quote from her paper:

> "Why is the data base community becoming so concerned about education and training? The reason is that Computer-readable data bases and data base use is an important and sizable economic reality and that for the first time in history, computerized generation, processing, and retrieval are a significant part of the total IS & R activity of the western world. Evidence of this is seen in the numbers and growth ratio of;
>
> Data Bases
> On-line Software Packages
> On-line System Vendors
> Data Bases that are on-line
> Records that are on-line
> Data Base Services
> Searches for Data Bases"[1]

The following tables give us some indication of the growth of this activity.

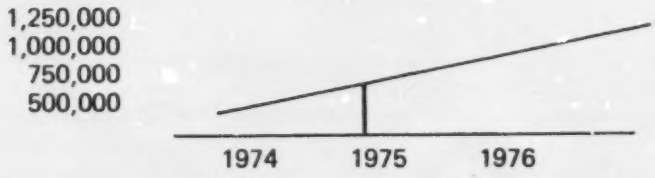
	No. DBs	% DBs	No. Records	% Records
U.S.	160	58 %	46.3M	89 %
Non U.S.	117	42 %	5.7M	11 %
	277	100 %	52.0M	100 %

[1] Williams, Martha E. Education and Training For On-Line USE Of Data Bases, paper presented at The EUSIDIC Conference – Graz, Austria

Data Bases and Records-Scientific and Technical[1]

	No. DBs	% DBs	No. Records	% Records
Sci-Tech	161	58 %	25.6M	49 %
Medical-Line Sci.	28	10 %	6.6M	13 %
Non Sci-Tech	42	15 %	4.3M	8 %
Sci-Tech Relation	46	17 %	15.5M	30 %
	277	100 %	52.0M	100 %

Data Bases and Records-Scientific and Technical [1]



Growth in On-line Searches[1]

The growth of this activity in the last three to five years has created a great demand for understanding how to use it. Each of the component parts of on-line services are developing different designs to train potential users of the service. These designs are often overlapping and incompatable. It is not uncommon for users and potential users to be inundated with printed materials offering solutions to the problems encountered in using the higly recommended on-line systems. All institutions who have responsibility for information activities rush to meet this new need. Producers of Data Bases, Processors of Data Bases, Universities, Professional Societies, Search Service Organizations, and Practitioners from Industry, all are addressing the subject before us today – Training for on-line use of data bases.

I would like to make it clear at this point that I do not propose to outline or review those activities that have been undertaken to meet this need. (Each of those institutions mentioned has attempted to understand the nature of the problems and have provided the content and methods to meet the needs). Nor do I intend to attempt to train those of you present here to use an on-line system. Such an undertaking is beyond the scope of the assignment given me by the technical program chairman. I do, however, wish to suggest some basic consideration that I feel must be understood if the on-line use of Data bases are to meet the needs of those who use them and at the same time realize the goals of those who produce and deliver them.

It is my contention that the effective use of data bases on-line depends upon the recognition and preparation for six basic interfaces. The identification of these interfaces and the adequate attention to the significance of these interfaces are the foundations of the preparation for training activities which can lead to the fullest utilization of on-line data base information transfer.

The six interfaces which I suggest to you as basic elements for training in the use of on-line data bases are:

1. The Man-Computer Interface

---

[1] Williams, Martha E. „Data Bases" Bulletin–A.S.I.S., December 1976, pp.20-21

2. The Man-System Interface
3. The Man-Data Base Interface
4. The Man-Man Interface
5. The Man-Print Interface
6. The Man-Peers Interface

First, The Man-Computer Interface. I do not mean by this that the engineer user must become an expert in computer technology. However, in preparing to use an on-line system, it is important to understand the basic characteristics of the computer. One such fundamental is the difference between human intellectual reading and the 'pattern matching' that the computer uses for so called reading. (Illustration: USA, U.S.A. and U S A).

Another basic computer fundamental is the sorting characteristics of a given computer system and the effect this may have on the locations of data on the inverted file used for search. The nature of space as the computer sees it is a fundamental concept that is important for insight as to one's performance. The nature of the loading of the data base is yet another.

It is my contention that the man computer interface has not yet been fully recognized as a fundamental element in training for on-line activities. We at Engineering Index, Inc. have begun to introduce such concepts in our training programs and have found a very enthusiastic response. However, much work yet needs to be done.

Second, The Man-System Interface. This is an obvious area of concern and is addressed by every vendor of on-line services. The learning of the commands to acquire some response is uppermost in the service center's mind. In practice this interface is presented first and is used to enable the searcher to gain confidence. I need not elaborate on the elements of this interface, but I would caution you not to allow this interface, which does provide results quickly, to signal too high a success quotient in any real training programs.

Third, The Man-Data Base Interface. This interface must be seen in two parts. The first is the user's need to understand what a particular data base includes and when it is appropriate to use that data base. Questions must be asked such as: which journals are covered? Is there complete coverage or is there selectivity? Are monographs, conferences, technical reports, text books, preprints and patents covered? How up to date is the data base? How frequently is it updated? Are there abstracts given with the citation? Are numerics tables flagged? These and many other questions constitute a good interface with the data base.

The second aspect of this interface is more specific and is system dependent. Engineering Index, Inc. knew, in general, that each of our COMPENDEX customers, particularly the On-line services, were making various software adaptions to data from our tapes as they were loaded, but it was not until we ourselves began doing experimental on-line retrieval that we noticed remarkable differences that can impact on search. Naturally, we looked to see which 'variation' was the BEST, but it isn't that simple, there is no one way of loading that appears to be the BEST way. Each system has unique strenghts.

All of us in using the various information tools in printed form, such as encyclopedia or atlases, are familiar with the condition of two or more information sources with the same basic data that are arranged and displayed differently. If you have two maps of the same area (one for a hiker and one for a motorist) you will tend to use one or the other depending on what you want to do and how you want to get there. It is much the same with the competing on-line services. Each has adapted the COMPENDEX data to his system and thus created some secondary characteristics that are useful to know in connection with on-line search for maximum efficiency and cost effectiveness.

Fourth is The Man-Man Interface. At the present this interface is a very prevalent aspect of on-line searching which may some day be eliminated by more sophisticated software. By this on-line mean the negotiations which takes place with the engineer's 'ultimate' use and the

'intermediary user' who actually does the search at the terminal. This activity is often referred to as the query negotiation because it must truly be a dialog, not only in the ordinary sense of explaining a problem and anticipating a solution, but also there is the added dialog that the intermediary introduces because of his knowledge of the data base, how it is arranged, what kind of information is displayed, and even more important, what kind of information searchable.

The query negotiation is largely an art form rather than a science, for there are no established rules, no established forms and guidelines. Perhaps as more attention is directed toward the importance of this interface, as 'ultimate' user feedback is gathered and analyzed some basic training can be developed to provide guidance. I think it more likely that this particular interface will remain mostly an art form until some phase of this interface can be automated.

Fifth, is the Man-Print Interface. This interface is immediately recognized as the traditional information practice. Browsing the book on the in-print form of the data base provides a familiarity with the data base that enhance the on-line search activity. Some data base producers feel so strongly about this interface that they restrict access to the on-line version of data base to those users who also have the in-print version.

In a very real sense, the on-line inverted file version of a data base is like an elaborate back of the book index. In the early versions, the entries in this index were limited to the indexing terms, various codes, and words from the title as applied by the data base producer. Increasingly, all the words, formulas, acronyms, proper names and other non-traditional access points are found on the inverted files. This is accomplished by loading the full text of the records supplied by the data base producer.

With the availability of this new dimension in searching on-line, it became necessary and useful to study, not only the various vocabulary tools and classification schemes, but also the text of the printed version. This interface provides the language of the engineer author – a direct communication form – with the on-line engineer user.

Sixth, is the Man-Peers Interface. The on-line activity must finally be shared with fellow users of this search methodology. It must be recognized that the on-line sercher is just beginning to understand and handle a new technology – a technology that is changing daily as new systems are developed, new standards tried, new configuration set in place. The user cannot depend solely on the training provided by the service vendors of the system nor on the producers of the data bases, he needs to learn from his peers.

This interface needs to be given much more attention and better structure for the benefit of all. Learning from peers must be provided as feedback to both the computer service centers and the data base generators. The rise of user groups is a common phenomena in the computer world. It isn't a frivolous or social need, but a basic need to exchange experiences and, if need be, to call for changes that would make conditions better for the user of the service and its data bases.

In summary, much work is being done in all parts of the world, and in all segments of the information community with regard to training for on-line use. Soon reports of success and failures will enable us to evaluate the first steps now being taken to prepare users for this activity. I have not dealt with methodologies, materials, contexts or many other aspects of this new function. I do feel, however, that the present state of the art requires close attention to the six interfaces I have identified so that the preparation of training activities can meet the needs of the users who now interact with machine readable records of man's technology.

THE ROLE OF SCIENTIFIC AND TECHNICAL SOCIETIES IN INFORMATION TRAINING OF ENGINEERS

A. Górski – POLAND

Contemporary technology demands the continual education and improvement of qualifications of engineers which is the object of interest in all countries and scientific and technical societies.

The training of engineers in the field of scientific and technical information, which is the base of every research, project and construction work, is of special value now.

The training of information users, before all, consists in convincing them about the social meaning and needs of information use and learning how to use it. Every potential information user should then:

– accept the information as chief means for increasing his knowledge which stimulates new ideas leading to improving of constructive mental activity and using of information as fundamental methods of his work;

– acquire techniques for proper use of accessible information sources;

– be an active partner in co-operation with information workers.

Scientific and technical societies are very interested in assuring good scientific technical information for their members, and also in establishing proper conditions for its most effective use in the implementation of new techniques and economic solutions. Therefore these societies are initiators and creators of many scientific technical information systems in different fields, and also they initiate many courses for training their members as information users.

The training of information users includes:

– publicity of information using, and

– the proper training

Publicity of information is directed towards the potential users who are not convinced about the value of information and do not feel the needs and aim of information use, or else they do not know how to find information and how to use it. If the members use already information, puplicity stimulates them to enlarge information using and to improve their qualifications for this purpose and to participate also in the information process through rendering their achievements and evaluation of information sources for request of information centres.

The mostly commonly applied forms of publicity are:

– placards, leaflets, folders, advertisements in periodicals;

– different kinds of exhibitions;

– publication of guides and instructional materials;

– broadcasting, television, tape-recording, video-tape-recording.

For example, the great achievements in the field of information publicity in Poland have been accomplished by the Chief Technical Organization (NOT) – Federation of Polish Scientific Technical Societies. Active information publicity is carried out by technical publication of periodicals published by NOT and Scientific Technical Societies (STS) and also in the form of various exhibitions in the technician's Houses NOT, within "Books and Technical Press Days" etc. NOT and STS work out and issue special guides for their members. These guides also contain lists of information centres, the subject matter and forms of their information services.

The Council of NOT accepted in 1974 "Program on development activity of NOT and STS in the field of scientific-technical information for the period 1974-1978". In this document

much attention was sacrificed to the problem of information publicity and also of information users training.

In the new program of activities NOT and STS for the period until 1980 much attention is directed to the problem of training information users. The main tasks in the above-mentioned scopes concern organizational units of NOT and STS in establishments of national economy (plants, workshops, design offices, laboratories, scientific institutes etc); in Poland there are about 12000 of those units. The engineers and technicians are members of these units and therefore activity of these units can help to create the conditions and habits to use information materials at all levels.

The Main Committee for Scientific-Technical Information and Libraries NOT prepared and issued in 1976 a publication entitled "Scientific, Technical and Economical Information in work of NOT and STS". This brochure contains many instructions for developing the activity in the field of scientific-technical information in all organizational units of NOT and STS.

The program of information activity for 1976–1980 foresees the organization of training courses for engineers and technicians in enterprises and also the organization of training courses for lecturers on enterprises courses. This program includes preparation of training materials for the courses and preparation of a guide entitled "Scientific and Technical Information in Work of Engineers and Technicians".

The great achievements with regard to information publicity are found in the organizational units of NOT and STS in Poznan. They organize active publicity for the Poznán International Fair for all Polish engineers and technicians attending the Fair. They help participants to find the proper department of exhibition, to obtain trade literature and arrange meetings of exhibitors with specialists who arrive at the fair, as well as professional sessions. Those units publish occasional bulletins, brochures and other publicity materials.

The training of information users is organized by organizational units in above mentioned enterprises in a close cooperation with information centres. For this training they also use the teacher specialists from outside.

The training organized by units of NOT and STS in information centres is called "inside" training. The purpose of this training is to teach engineers and technicians how to gather, process and disseminate information and also to acquaint them with forms and methods of information services offered by enterprises information centres. This training is, as a rule, organized:

– for new personnel;
– once a year for all personnel in industry for improvement of their qualifications;
– for special needs e.g. in the case of change of services, new techniques for information service, new information languages etc.

The engineers and technicians are also trained by specialists from branch information centres (BCINTE) during their stay in enterprise information centres for instructing them.

The training of information users by specialists from outside has the following forms:

Special training courses. The participants of those courses are free of work during the course. The program of course consists of 9 classes; the program of courses for different groups of users are elaborated by Training Department of NOT – there are following courses:

– for directors and vice-directors of enterprises, companies and enterprise unions;
– for managers of departments in enterprise;
– for engineers and technicians of middle post;
– for engineers and technicians of design offices and other research and development institutions.

The training program are concerned with the following aspects: the role, meaning and purpose of information activity, organization of information services in Poland and abroad, sources and tools of information systems for dissemination of information, and technical

methods used in information work.

The experience of training in Poznán region based on these programs of NOT showed that the best results are obtained under following conditions:

– the courses should be organized based on materials and elaborations of own enterprise information centre;

– the lecturers should be outside specialists (the same branch as the participants of course), it is preferable if lecturers are from a higher hierarchical unit within the enterprise. Practical exercices should be demonstrated by the specialists from the regional enterprise information centre;

– the courses should last 2–3 weeks with no more than 2–3 classes daily. After lectures the participants should be encouraged towards individual selftraining, looking for materials and selecting them;

– the groups should not exceed 25 participants interested in the same field and from the same production department;

– the lecturers should have good professional contact with participants. It is important especially for solution of given technical problems and for selection of mostly needed information materials;

– the information centre, in which organized courses are held should be very well equipped and should carry out the full information activity and also possess complete information sources etc.

Scientific technical information, as a special subject is a necessary part of the program of all technical courses and also in the programs of conferences and technical meetings organized by NOT and STS. Scientific technical information should be given in lecturers by the important specialists in 1–3 classes on special branch courses and 3–9 classes on general technical courses e.g. invention and rationalization, patents activity, standardization, editorship, environmental preservation, reprography and polygraphy techniques, informatics etc.

For the needs of training the publications issued by the Centre for Scientific Technical and Economic Information (CINTE) are used.

Engineers as information users are also trained in courses designed for information workers. For example, the Committee on Scientific Technical Information of Branch NOT in Poznán organized in 1972–1976 30 fundamental courses (100 classes) for the workers who begin to work in information centres; 5 special courses in the field of reprography and polygraphy for information workers and two courses on editorship and publishing.

In the mentioned courses 20% of the engineers who participated were not information workers.

Much activity in training of engineers and technicians as information users is also evident in the Branch NOT in Lòdz.

The activity of user training can be increased thanks to the exchange of experience and training materials on an international level. In this field work of WFEO/CEI can be particularly helpful.

SUMMARY OF SYMPOSIUM

by

F. Karl Willenbrock[1/]

This Symposium had a dynamic character; changes occurred during all phases up to and including the final session.

Session I was chaired by Professor S. Simeonov of Bulgaria. The opening paper which I delivered described the activities of the WFEO/CEI. The aims of the Committee in the field of engineering information are broad. However, it has particular concern with making engineering information more useful to the practicing engineer and so it has great interest in this Symposium on "Technical Information and Its Users".

The next two papers described the activities of two major international organizations concerned with engineering information, Unesco and UNIDO. Mr.J. Tocatlian discussed the significant internal changes in Unesco as the General Information Program has been formed. Also, he indicated that the UNISIST program has entered a new phase of broadened acceptance.

Mr. R.T. de Mautort, Chief of the Industrial Information Section, described UNIDO's interest in engineering information as a tool in industrial development. He reported that UNIDO has just completed some administrative changes aimed at giving more importance to the questions of technology transfer and information transfer within the Organization. Of great importance is the planning and establishment of an Industrial and Technological Information Bank which is currently underway as a complement to UNIDO's present industrial information activities.

In the final paper in this session, Professor I. Popov, President of the Central Council of Scientific-Technical Unions of Bulgaria, presented a comprehensive picture of the Bulgarian national information system for science and technology. He explained how the scientific-technical unions supplement the technical information centers by enlarging the distributive network of information and making potential recipients of technological information more information-oriented.

Session II was chaired by Dr. P. Lazar (Hungary) and focused on general information systems.

Two papers from the USSR were presented. The first was by Professor A.I. Mikhailov and was read by Dr. V. Krasnov. He described the information services available to engineers in the USSR based on his long experience in VINITI. Both the diverse sources of information available and the diverse information needs of engineers were stressed.

Professor G. Pospelov discussed theoretical problems associated with the relation of information and data to human knowledge. He developed a model of an engineering information system with particular attention to a subsystem for engineering design. He emphasized the importance of computer use because of the complexity of the design process.

The next two papers were presented by speakers with strong convictions about the importance of the end-user of engineering information. The paper of Ms. A. David (France) described the many sources of information available to engineers in the two general categories

---

1/ Read at the closing session of the Symposium.

of documents and people and also how these sources need to be combined by the engineer in his work. Her model was a convincing demonstration of logical clarity.

Mr. K.Klintøe (Denmark) described his experience in a user-oriented information system – the market-oriented approach of the Danish Technical Organization. He sees technical information as a commodity which needs to be marketed much as other commodities are. The needs of the end-user must be clearly identified and the information product must be shaped to meet that need precisely to be useful. He also emphasized the necessity of paying visits to get results.

Session III was chaired by Professor N. Palagatchev (Bulgaria), and included papers on a number of specific engineering information systems and services. Dr. V. Krasnov (USSR) described the highly organized information system available in the USSR to engineers responsible for decision-making in the production process. He contrasted these needs to those of engineers concerned only with technical problems. Their needs are supplied by the technical information system, and he also pointed out how locally generated information is fed back into the national system.

The paper on standards information by Dr. L.D. Eicher of the USA was read by Dr. Willenbrock. Characteristics of standards as a particular type of engineering information were described including the fact that they are usually prepared by committees and undergo extensive revision before acceptance. Their importance in the production and also marketing of products was emphasized.

Next, the paper written by Mr. O. Auracher on INPADOC and Its Services was read by Mr. H. Rasinger. The International Patent Documentation Centre was founded in 1972 by Austria and the World Intellectual Property Organization (WIPO), a UN specialized agency, and serves as an international center for providing patent information services. A great number of patents are published annually, approximately 800 000. INPADOC provides a number of services to those interested in obtaining patent information from its data base of over 3 million entries.

Mr. V. Piróg (Poland) defined various categories of product and trade literature and the various available sources of information on products. He also described how information centers can organize product literature, and suggested steps to improve this type of literature.

Dr. S. Al-Shaikhly (Iraq) listed the types of statistical, economic, and marketing data needed in engineering practice. Although statistical and marketing data are usually available from government agencies, most engineers do not make effective use of such data. He described the sources of data available in major countries and proposed five alternative for developing and utilizing statistical, economic, and marketing data information systems for engineers.

Session IV was divided into two parts, the first of which was chaired by Dr. Adam Wysocki (Unesco).

Professor A. Neelameghan (India) described the benefit to university engineering students of training in STI systems. He emphasized the importance of the management of engineering information as skill students and practicing engineers need to develop. He emphasized and illustrated the difference between the engineering information needs and sources of students and practicing engineers as they go through various stages of their career.

The paper of Ms. I. Wesley-Tanaskovic (Yugoslavia) was read by Professor M. Sekulic. It described the role technical information centers have in the training of both students of engineering and also practicing engineers. Adequate resources should be allocated by the managers of technical information services to educate and training programs for users which should be formulated in collaboration with educational institutions and professional associations.

The second part of this session was a panel discussion of the UNISIST Guide or Teachers on the Education and Training of Users of Scientific and Technical Information chaired by

Dr. S. Al-Shaikhly. Professor A. J. Evans (UK), the principal author of the Guide which was distributed to the Symposium participants, reviewed its content. He emphasized that the Guide was developed out of his 15 years of personal experience and was designed for maximum flexibility. Since this is the first such attempt, it stands as an experimental publication which is open for comments and recommendations.

The panel members which included Ms. F. Zahawi (IDCAS), Professor H. J. Manecke (GDR) and Professor A. Neelameghan all emphasized the great importance of user training and agreed on the importance of such a Guide. In addition, a number of constructive comments were made from the floor. Some possible changes for future editions of the Guide were suggested.

Session V was the final session.

The first paper by Ms. J. Kuglerova (Czechoslovakia) was read by Ms. Klimesova. The paper describes training programs being offered in Czechoslovakia with details on the lectures, textbooks and practical experience used. Also research activities were described.

The paper of Mr. J.E. Creps (USA) related broadly to the use of on-line systems with particular references to Engineering Index. He indicated that there are now 277 machine-readable systems in operation including 52 million items and they are growing very rapidly. Mr. Creps stated there are six major components in the training for operating an on-line system effectively. The skill and understanding needed can be gained by an individual engineer or an information officer or a combination of such persons.

Mr. A. Górski (Poland) gave the final paper of the session. He accented the importance of publicity about information services and also the proper training of users. The extensive program of the engineering organizations in Poland was described.

Finally, a few general observations about the Symposium.

1. There appears to be a pervasive conviction that training is essential in order for users to make effective use of information systems and services. The fact that Unesco and UNIDO have recognized this fact and have been so active in this area is most commendable. The educators must match their educational programs to the requirements of their students and practicing engineers they are training. The flexibility stressed by Professor Evans is very important.

2. It is of great importance to shape the information system or service to the user, or customer, to borrow a term from Mr. Klintøe's marketing analogy. The user should not be forced to conform to a system which is illmatched to his requirements. The managers of information systems must learn to design their services according to the needs and habits of the users.

3. There are many different types of information. Patents, standards, statistical, economic and marketing data, trade publications were described by various speakers at this Syposium. Many types are needed by the practicing engineer, and are essential for the transfer of technology. These various types of information should be integrated into the various systems and services made available. This task is not simple; it cannot be handled solely by the managers of information systems or services. It is a challenge to the engineering profession, their professional organizations, and various specialists who have detailed knowledge about these different types of information including the sources and the characteristics. It is also a challenge to the WFEO's CEI which should assist in this integration process. A specific example is the Industrial and Technological Information Bank of UNIDO, which is a project requiring extensive integration of various types of information.

4. The new technologies which are becoming increasingly available pose a challenge to the information system managers and also to users of these systems. How can these technologies be most effectively mobilized to improve the interface between information systems and their users? The CEI hopes to study this interface at its next meeting and Symposium which is scheduled for Ottawa, Canada, in June, 1978. The Canadian Institute for STI (CISTI) has very

advanced systems in operation and in addition has carried out extensive programs in developing countries. It should provide an excellent opportunity to explore the applications of new technologies.

LIST OF LECTURERS

Dr. F.K. Willenbrock
Dean
School of Engineering and Applied Scence
Southern Methodist University
Dallas
Texas 75275
U S A

J. Tocatlian
Bureau of Studies and Programming
Unesco
7, Place de Fontenoy
75700 Paris
France

R.T. de Mautort
Chief
Industrial Information Section
UNIDO
Lerchenfelder Strasse 1
A-1010 Vienna
Austria

Prof. I. Popov
Central Council of the Scientific — Technical Unions of Bulgaria
108, Rakovski str.
Sofia-1000
Bulgaria

Prof. A.I.Mikhailov
Director
All-Union Institute of Scientific and Technical Information
14, Baltijskaya str.
125219 Moscow, A-219
USSR

Prof. G.Sz. Pospelov
Corresponding member of the Academy of Sciences of the USSR.
Leninskij prospekt, 14
117901 Moscow V-71
USSR

Ms. A. David
Director
Centre de Documentation
Institut Francais des Combustibles et de L'énergie
3, Rue Henri Heine
75016 Paris
France

K. Klintøe
Head
Danish Technical Information Service
Ørnevej 30
2400 Copenhagen NV
Denmark

Dr. V. Krasnov
State Committee of Science and Technology
11,Gorki str.
103009 Moskow K-9
USSR

Dr. L. Eicher
United States Department of Commerce
National Bureau of Standards
Standards Information and Analysis Section
Washington, D.C. 20234
U S A

Dr. O. Auracher
International Patent Documentation Center (INPADOC)
Möllwalplatz 4
A-1041 Vienna
Austria

W. Piróg
Chairman
Committee of Scientific and Technical Information
Naczelna Organizacija Techniczna
Czackiego 3-5
Warszawa
Poland

Dr. S. Al-Shaikhly
National Centre for Engineering and Architectura.
Consultancy
P.O. Box 3290
Sadon Baghdad
Iraq

Dr. A. Neelameghan
Head and Professor
Documentation Research and Training Centre
Indian Statistical Institute
112 Cross Road 11
Bangalore 560003
India

Ms. I. Wesley – Tanaskovic
Institute for Military Medical Documentation
Pasterova 3
11000 Beograd
Yugoslavia

Ms. J. Kuglerowa
Central Office of Scientific-Technical and Economic Information
Konciktská 5
11357 Praha
CSSR

J.E. Creps, Jnr.
Executive Director
Engineering Index, Inc.
United Engineering Center
345 East 47th Street
New York
NY 10017
U S A

Dr. A. Górski
Naczelna Organizacija Techniczna
Ul. Stalingradska 5-9
Poznan
Poland

PRINTED IN THE PEOPLE'S REPUBLIC OF BULGARIA
BY THE CENTRAL COUNCIL OF THE
SCIENTIFIC – TECHNICAL UNIONS OF BULGARIA – 1978